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FORT UNION COAL

SCHOOLHOUSE TRACT

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FORT UNION COAL REGION

SCHOOLHOUSE TRACT ANALYSIS

SITE SPECIFIC ANALYSIS

OLIVER COUNTY, NORTH DAKOTA

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September 1981

Michael J. Penfold
State Director

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INTRODUCTION

The purpose of this action is to consider for leasing federal coal needed to support production of the Beulah Mine and to prevent the by-pass of 38.7 million tons of federal coal. Unleased federal coal represents 16 percent of the total coal in the Schoolhouse tract. Due to the scattered nature of the federal coal it might very well be bypassed if not leased.

This site-specific environmental analysis has been prepared for the Schoolhouse tract (Map 1) in accordance with federal regulations (43 CFR 3420). It will be used by the Fort Union Regional Coal Team to further consider competitive leasing of federal coal within the tract for a June 30, 1983 coal lease sale schedule. If selected and scheduled, the Schoolhouse tract will make a total of 38.7 million tons of unleased federal coal available for leasing. In addition the tract will contribute approximately 6.5 million tons of coal to the regional leasing target.

An 80 acre federal coal lease (M43083 ND) granted to Knife River Coal Mining Company in 1980 was studied and described in detail in a technical examination/ environmental assessment in December of 1979.

A federal lease obtained by Knife River in the tract (M041765 ND) in 1961, includes 1,600 acres of federal coal that was the subject of an environmental assessment completed in May 1981 as part of its 20 year adjustment.

The tract area was included in the West-Central North Dakota Regional EIS on Energy Development jointly completed in October 1978 by the State of North Dakota and the Bureau of Land Management (BLM). There is one state coal lease in the area. Most of the private coal is already leased. Permits have been granted by the state and federal governments to operate the Beulah surface mine and Coyote 1 coal fired generating station on the tract.

The emphasis of the analysis for this document therefore concentrates on the unleased federal coal. The unpermitted state and fee coal were examined followed by the areas currently under mine permit.

BACKGROUND

In September of 1980, the Dickinson District BLM Office adopted the West-Central North Dakota Management Framework Plan (MFP) for Oliver, Mercer, McLean, Stark, and Dunn counties, and a small part of Billings County. The land use planning process included identification of high or moderate potential coal areas, application of unsuitability criteria, indentification of resource trade-offs, and consultation with surface owners. As a result of that work, areas were identified that could be further considered for coal development. These areas are available for consideration for new competitive leasing, lease exchanges, and lease modifications.

Following land use planning, the BLM requested expressions of interest from industry. These expressions, along with other information, guided the U.S. Geological Survey (USGS) in delineating this tract. Results of that work are summarized in this document.

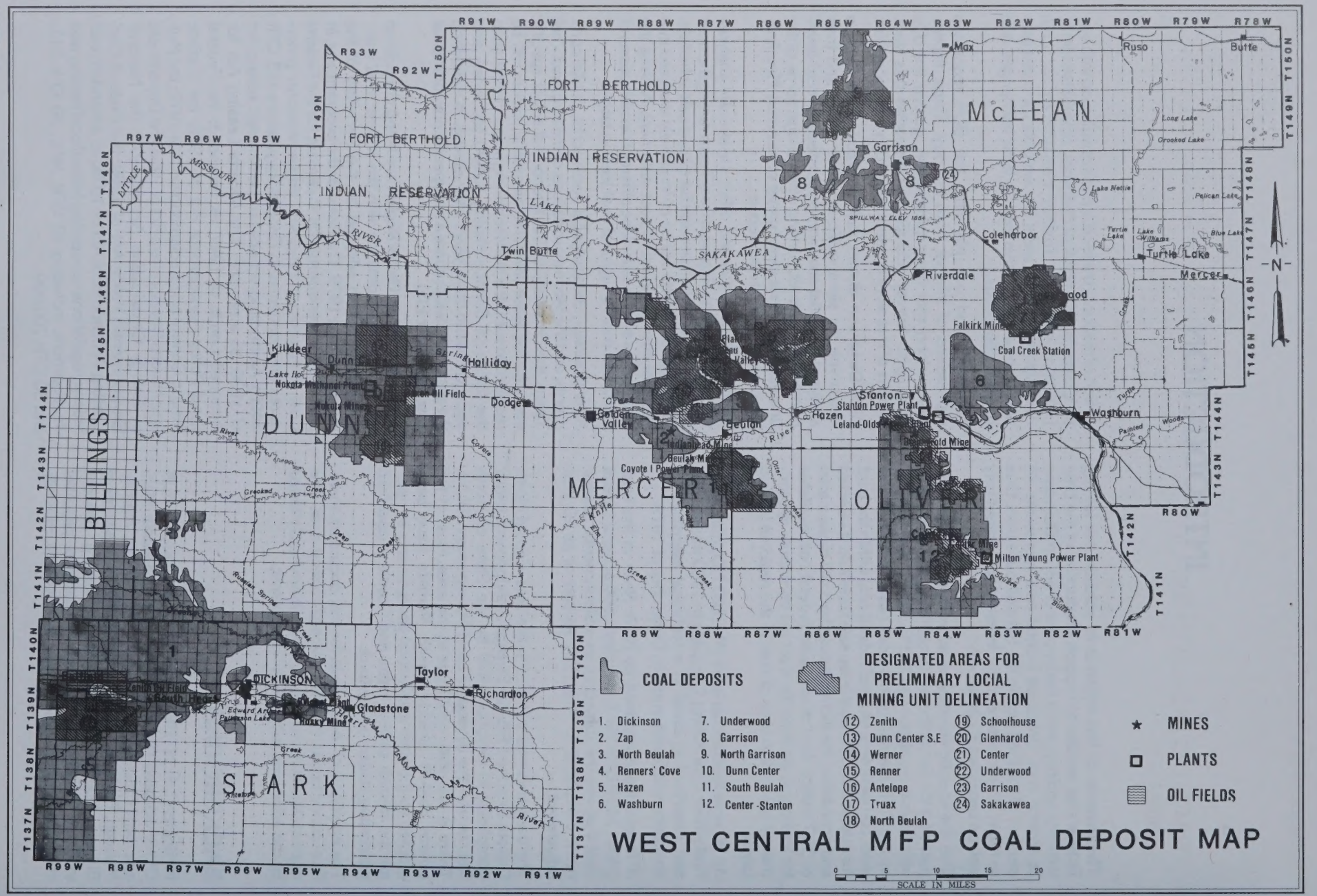
BLM Dickinson district staff inventoried the tract to determine the site-specific resource values and then analyzed potential environmental effects of coal development on this tract. Among other things, some of the unsuitability criteria were further considered. New findings are reflected in this report.

Information from this and other site-specific analyses will be used by the Regional Coal Team during the tract ranking and selection process for a lease sale schedule. The proposed tracts will be cumulatively analyzed in a regional environmental impact statement. Among the alternatives addressed will be different combinations of tracts that meet a regional coal leasing target.

After reviewing the analytical documents, public comments, and the recommendations of the Regional Coal Team, the Secretary of the Interior will select specific tracts for the lease sale. The successful lessees will be required to submit a plan for mining and reclamation to the Office of Surface Mining (OSM) for review and approval within three years after leasing. In evaluating the plan, OSM will prepare a site-specific environmental assessment or EIS.

Tracts in the Fort Union Region are being considered for leasing in accordance with the federal coal management program adopted by the Secretary of the Interior in June 1979. The basis for the program was, in part, the final environmental statement for the Federal Coal Management Program. Implementation procedures are contained in Federal Regulations (43 CFR 3400). Authorizing actions are the Mineral Leasing Act of 1920, as amended; The Mineral Leasing Act for Acquired Lands of 1947, as amended; the Federal Land Policy Management Act of 1976; the Surface Mining Control and Reclamation Act of 1977; the Multiple Mineral Development Act of 1954; the Department of Energy Organization Act of 1977; the National Environmental Policy Act of 1969; the Federal Coal Leasing Amendments Act of 1976, as amended; and federal regulations concerning federal coal leasing and development, including 43 CFR 3400, 30 CFR 211, and 30 CFR 700-899.

MAP 1



WEST CENTRAL MFP COAL DEPOSIT MAP

TRACT DELINEATION REPORT SUMMARY

The Schoolhouse tract lies approximately two miles south of Beulah, North Dakota just south of the Mercer-Oliver County line (Map 2).

The tract is based on the Beulah-Zap and Schoolhouse coal beds found in the Sentinel Butte Member of the Fort Union Formation (Paleocene).

For analytical purposes, the USGS developed a generic mine plan for the tract. The coal would be mined to a depth of 200 feet or until the limiting stripping ratio of 20:1 has been reached. The most probable end-use of the coal would be the nearby Coyote I electric power plant. A possible mining sequence is shown in Map 2.

Specific Tract Characteristics:

Acreage:

Surface:	Federal Leased	0
	Federal Unleased	0
	State	0
	Private	13,838
	Total:	13,838
Coal:	Federal Leased	1,200
	Federal Unleased	1,881
	State	1,598
	Private	9,159
	Total	13,838

Coal Reserves/Millions of Tons:

In Place:	Federal Leased	30.0
	Federal Unleased	43.0
	State	21.1
	Private	181.4
	Total	275.5
Recoverable:	Federal Leased	27.0
	Federal Unleased	38.7
	State	19.0
	Private	163.3
	Total:	248.0

Coal Quality: Average of samples as received from vicinity of tract:

Moisture	36.1%
Volatile matter	27.2%
Fixed carbon	30.5%
Ash	6.2%
Sulfur	0.8%
BTU's/lb	6,919

Surface Disturbance/acres

Mining: Annual rate, 227; Total Life of Mine, 10,877

Haul Roads: 188

Mine Facilities: Already built.

Stripping Ratio: 20:1 (maximum)

Coal Thickness: Beulah-Zap Bed, 10.9 feet (average); Schoolhouse Bed, 8.2 feet (average).

Mine Employment: Permanent employees at peak production would number about 140.

Royalties and Severance Taxes:
Annual Federal Royalty, unleased coal, $0.58 million
Annual Federal Royalty, leased coal, $0.08 million
Annual North Dakota Royalty, $0.28 million
Annual North Dakota Severance Tax, $4.50 million

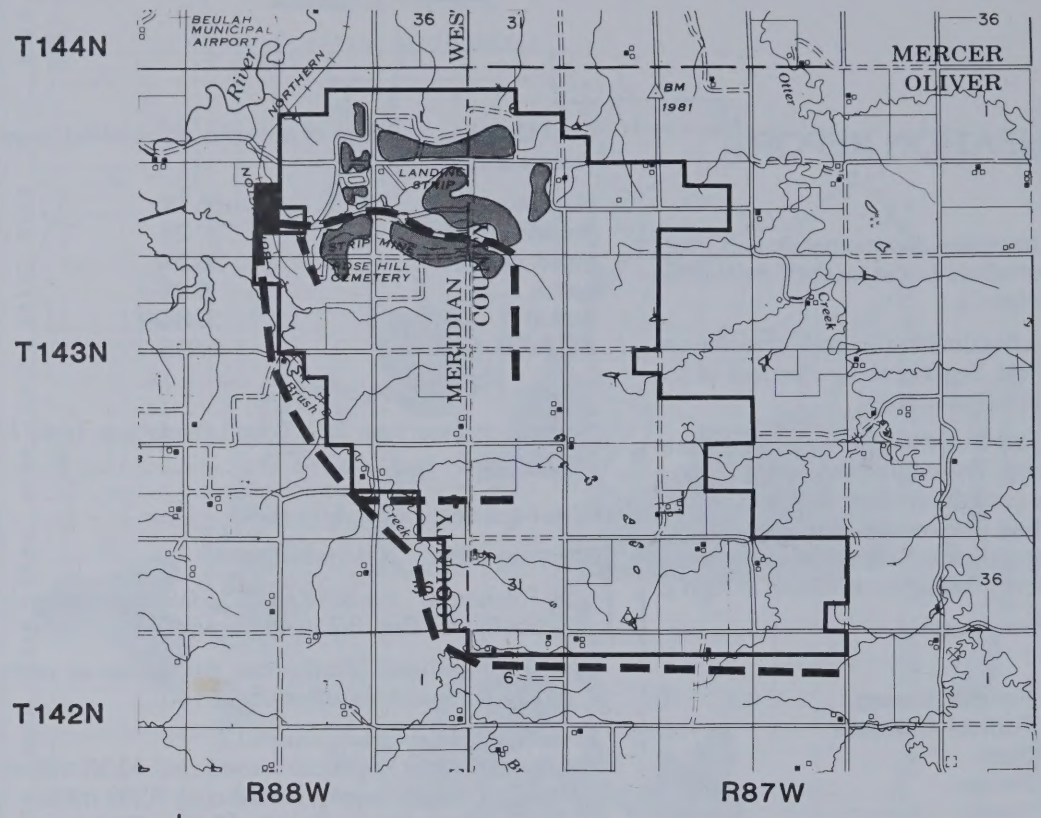
Water Needs:
Human Consumption, 4,000 gal./day
Source: Well water

Nonpotable, 60,000 gal./day
Source: pit dewatering

For more specific information on the proposed mining operation refer to the engineering, geologic, and land reports prepared by the tract delineation team.

NOTE: As the mine plans developed by USGS are of a generic nature and the actual mining sequence will be developed by the mining companies to fit their individual needs, the Resource Specialist assigned to the SSAs made the assumption that all lands within the tract boundaries would be disturbed to some degree. Therefore, acreage in the SSA may not always agree with that shown in the Tract Delineation Report concerning acreage disturbance.

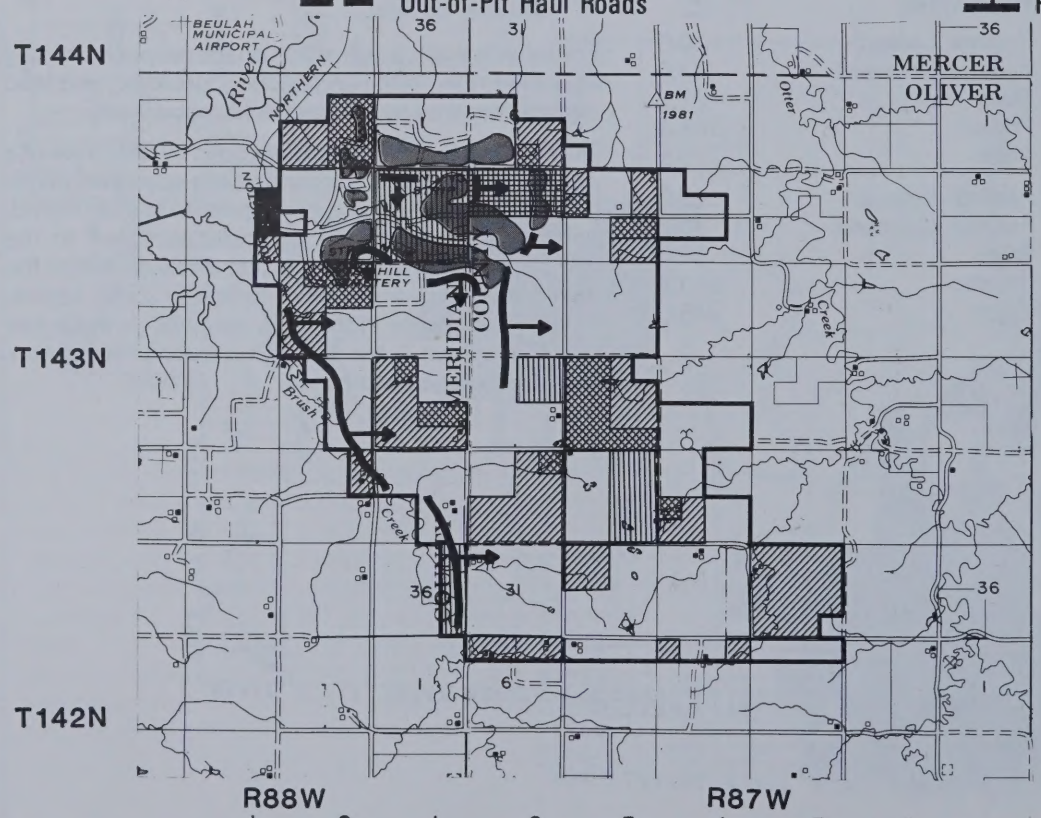
SCHOOLHOUSE TRACT



SURFACE OWNERSHIP

LEGEND

- Private Surface
- Tract Boundary
- Mined Out Areas
- Out-of-Pit Haul Roads
- Federal Coal
- State Coal (50%)
- Private Coal
- Leased Federal Coal
- Leased State Coal
- Surface Facilities
- Pit Advancement



SUBSURFACE OWNERSHIP

0 1 2 3 4 5 6

Scale In Miles

MAP 2

CHAPTER I
ALTERNATIVES

LEASING AND DEVELOPMENT

The alternative is to offer for further consideration the unleased federal coal in the Schoolhouse tract for competitive leasing. This tract has been identified as the logical mining unit for a 5.0 million ton per year surface mine having a 48 year mine life. The Schoolhouse tract has been delineated within areas designated as acceptable for further consideration in the West-Central North Dakota MFP adopted in September 1980. The tract does not include any lands for which the surface owner has filed a valid refusal to consent (to mining) prior to March 1, 1981. The tract has been fully cleared of unsuitability criteria numbers, 1, 2, 4, 5, 6, 7, 8, 10, 11, 12, 13, 16, 17, 18, 19, and 20 as defined in 43 CFR 3461. Criteria 9, 14, and 15 require further study. With the exception of criterion 3, all unsuitability criteria studies will be completed and fully applied before work begins on the final regional environmental impact statement; if not, this tract will be dropped from further consideration. Criterion 3 will be deferred until mining and reclamation plans are submitted to OSM and North Dakota Public Service Commission for final approval. Current unsuitability concerns are shown on Map 3. The following is a list of unsuitability criteria.

(1) Federal Land System
(2) Rights-of-Way and Easements
(3) Buffer Zones along R/W and Adjacent to Communities and Buildings
(4) Wilderness Study Areas
(5) Scenic Areas
(6) Lands Used for Scientific Studies
(7) Historic Lands and Sites
(8) Natural Areas
(9) Federally Listed Endangered Species
(10) State Listed Endangered Species
(11) Bald and Golden Eagle Nests
(12) Bald and Golden Eagle Roost and Concentration Areas
(13) Falcon Cliff Nesting Sites
(14) Migratory Birds
(15) State Resident Fish and Wildlife
(16) Floodplains
(17) Municipal Watersheds
(18) National Resource Waters
(19) Alluvial Valley Floors
(20) State Proposed Criteria

Relationship to Other Developments

Oliver and Mercer counties are at the center of coal energy development in North Dakota. The existing Knife River Beulah Mine within the tract produces 2.2 million tons of coal annually for the recently constructed Coyote 1 Power Plant. An increase in production of 850,000 tons per year is likely in 1986. North American Coal Corporation's Indianhead Mine, about 6 miles northwest, supplies 1.2 million tons of coal annually to the Stanton Power Plant. North American's Falkirk Mine, a little over 30 miles to the northeast, supplies 5.6 million tons of coal annually to the Coal Creek Power Plant. The Glenharold Mine, 20 miles east, supplies 3.8 million tons of coal annually to the Leland Olds Power Plant. Baukol Noonan's Center Mine, 20 miles southeast, produces 4.1 million tons annually for the Milton R. Young Power Plant.

The Nokota Company proposes a mine and indirect liquefaction plant near Dunn Center. Coteau Properties, Inc. will eventually supply approximately 14 million tons of lignite annually to the Antelope Valley Power Plant and the ANG Coal Gasification Plant 10 miles north.

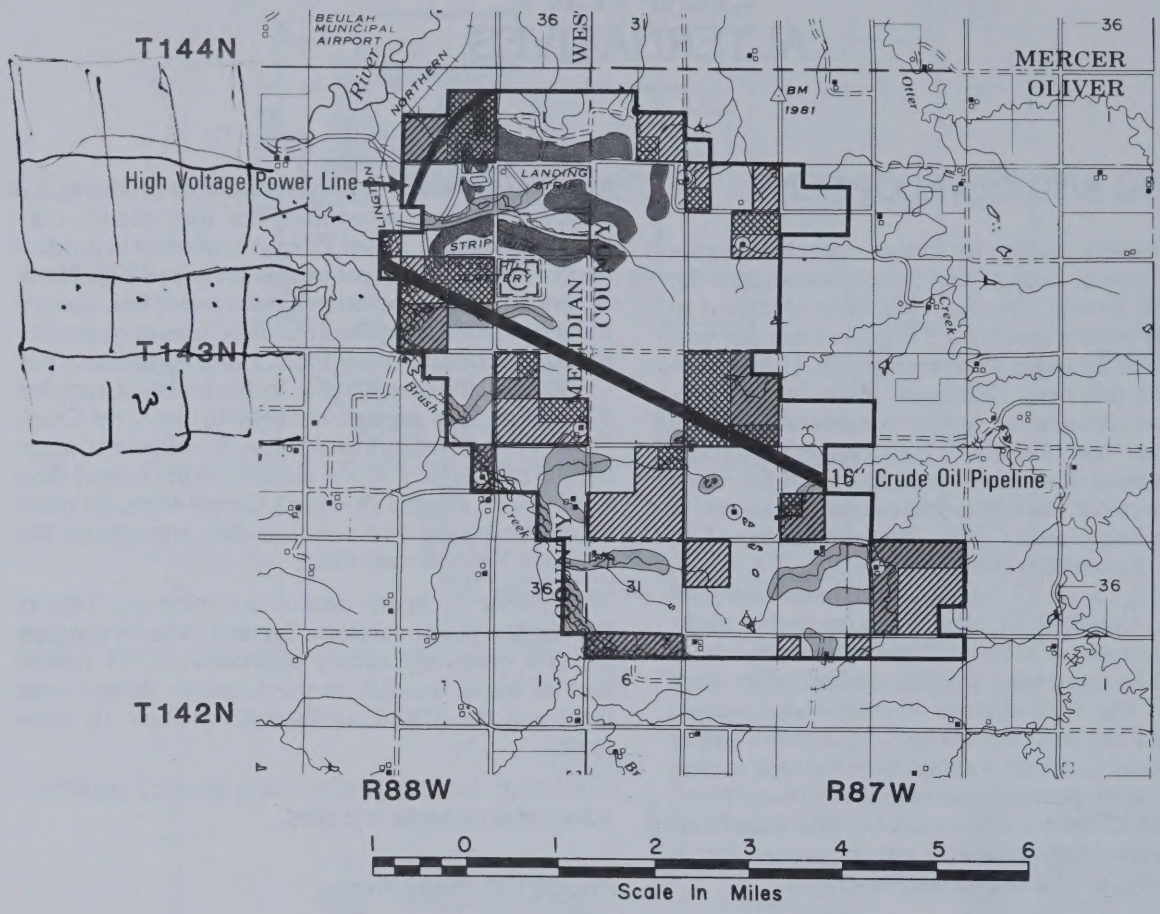
In addition, farming and ranching are also significant activities in and near the area.

Mitigation Measures

This alternative assumes that proper mining and reclamation will be carried out according to existing state and federal regulations. These include: OSM Reclamation and Enforcement Regulations (30 CFR 700-899), Environmental Protection Agency (EPA) regulations (40 CFR 0-1399), Council of Environmental Quality (CEQ) regulations (40 CFR 211), Department of Interior coal management regulations (43 CFR 23 and 3400), and North Dakota Public Service Commission laws and regulations (Chapter 38-14.1 of the North Dakota Century Code and Article 69-05.2 of the North Dakota Administrative Code).

NO LEASING ALTERNATIVE

Federal coal would not be offered for lease under this alternative. The tract contains 38.7 million tons of unleased federal coal which represents about 16 percent of the total recoverable reserves. The unleased federal coal is scattered predominantly throughout the southern half of the tract. If the coal is not leased, it would be bypassed and probably never be mined. Some of the remaining coal in the southern part of the tract, however, could be mined. Some disturbance would likely occur to private surface of the unleased federal coal.



SCHOOLHOUSE TRACT

LEGEND

- Federal Coal
- Federal Coal Lease
- Mined Out Areas

Areas being considered as unsuitable by BLM and others based on existing information.

- Wildlife Habitat
- Alluvial Valley Floor
- Potential Dwellings

-N-

Note: Detailed maps are available for inspection at the Dickinson BLM District Office. (Rights-of-way too numerous to show.)

MAP 3

CHAPTER II
AFFECTED ENVIRONMENT

This section is a description of the current environment with anticipated changes from ongoing trends. Within the Williston Basin there has been an increase in oil and gas exploration and this trend is expected to continue. The physical resources described in this section represent only existing conditions while the social and economic sections account for existing conditions and ongoing trends. The Beulah mine currently produces 2.2 million tons of coal annually from the tract. Production could increase to five million tons annually by 1995. Some disturbance would likely occur to the surface over the federal coal.

TOPOGRAPHY

This area lies within the glaciated Missouri Plateau section of the Great Plains physiographic province. Glacial debris are thin or absent. Relief in the area is largely erosional. Relatively soft siltstone, sandstone, and claystone layers have been dissected locally to provide badland topography; but more commonly, smooth slopes are found between benches, resulting in a rolling to hilly topography. Maximum relief averages about 100 feet in the area. The area is drained by the Knife River and its tributaries.

GEOLOGY AND MINERALS

This tract is underlain by the Sentinel Butte Member of the Fort Union Formation (Paleocene). In this area the Sentinel Butte is about 500 feet thick and consists of yellow-brown to gray, fine to medium grained sandstone, interbedded gray and brown clay and siltstone, gray bentonitic clay beds, and lignite beds.

Two lignite beds are mined at Knife River's Beulah mine and form the reserve base for the Schoolhouse tract. The Beulah-Zap bed, which is the lowest mined bed, averages 10.9 feet thick. In-place tonnage within the tract is about 168 million tons. The Schoolhouse is the uppermost bed mined by Knife River. It averages 8.2 feet thick. Approximately 275 million tons of lignite in place (248 million tons of recoverable lignite) lie within the tract boundaries.

PALEONTOLOGY

No fossils of scientific importance are known to occur on this tract.

SOILS AND RECLAMATION POTENTIAL

Most of the soils in the Schoolhouse tract have formed in a thin mantle of glacial till overlain by windblown silts and sands. Some are derived from the glacial till itself and a few from residual shale and sandstone. Alluvial soils are formed along major drainageways in the tract. Most of the soils are deep, loamy, and coarse-loamy, well drained and of medium to high fertility.

Slopes over this area are mostly quite gentle. The soil mapping units with steeper slopes seen on Table 1 are primarily along breaks into drainageways.

The tract is dominated by soils with fine sandy loam surface layers which are highly susceptible to wind erosion. Water erosion also begins to be a problem when slopes are greater than six percent (Table 1).

The quality of soil in the area is reflected in the soil suitability for cover of surface mined land ratings and acreage figures for the Soil Conservation Service (SCS) Order II county soil survey mapping unit in the tract (Tables 1 and 2). Of the 13,838 acres in the tract, 10,707 acres or 77 percent is in the "good" suitability category, 2,342 acres or 17 percent is rated "fair," and 791 acres or 6 percent "poor." About 700 of the 791 acres in the poor category are areas in some stage of the mining process (i.e., older mine spoils, areas currently being mined, and areas in some stage of reclamation). The remainder rated poor are primarily small scattered units of saline/sodic soils.

TABLE 2
SUITABILITY OF SOIL FOR RECLAMATION BY LANDOWNER IN THE SCHOOLHOUSE TRACT

LANDOWNER NUMBER	ACRES GOOD	FAIR	POOR	TOTAL
1a	157	3	0	160
b*	72	3	85	160
2	343	97	0	440
3	102	18	0	120
4	161	72	7	240
5	489	311	0	800
6a	80	0	0	80
b	429	51	0	480
c	133	27	0	160
7a*	35	28	97	160
b	35	5	0	40
c	19	21	0	40
8	143	17	0	160
9	281	33	6	320
10	89	56	15	160
11	36	4	0	40

12a*	55	24	81	160
b	39	41	0	80
c*	186	155	99	440
d	98	62	0	160
13	156	4	0	160
14a	160	0	0	160
b	195	45	0	240
c	318	2	0	320
15a	175	25	0	200
b	320	0	0	320
16a	345	135	0	480
b	320	0	0	320
17	106	44	10	160
19	16	24	0	40
20a	112	48	0	160
b*	250	36	74	360
c	101	19	0	120
21	167	70	3	240
22*	666	113	141	920
23	160	0	0	160
24a	240	0	0	240
b	272	48	0	320
c	359	41	0	400
26	157	3	0	160
27	25	14	1	40
28	281	39	0	320
29*	140	46	131	320
30	31	9	0	40
31	160	0	0	160
32a	80	0	0	80
b	80	0	0	80
33a	453	97	10	560
b	146	14	0	160
34	112	8	0	120
35	306	14	0	320
36	212	108	0	320
37*	133	8	19	160
38a	74	6	0	80
b	49	31	0	80
39	122	38	0	160
40a	40	0	0	40
b	55	25	0	80
41	35	5	0	40
42	102	58	0	160
43	26	54	0	80
44	81	27	12	120
45	143	17	0	160
46	149	11	0	160
47	71	9	0	80
52	24	16	0	40
TOTALS	10,707	2,342	791	13,840
% OF TOTAL	77%	17%	6%	100%

1/ Based on Table 1. Planimetry by BLM. Legal description of land and owner name corresponding to landowner number available at Dickinson District Office. Individual landowner holdings that are not contiguous are depicted separately by small letters.
*Indicates tracts where the acreage figure under the "poor" category is primarily composed of land already disturbed for coal mining.

The suitability data in Table 2 is developed by surface landowner because North Dakota law does not allow the transfer of soil material from one landownder to another unless written consent is given. Each person's land must be reclaimed with soil originally removed from their respective holdings. Table 2 therefore indicates the degree of difficulty to reclaim individual landowner holdings based on soil suitability as plant growth material or surface-mined land.

HYDROLOGY

Surface runoff from this tract drains to the Knife River by way of Brush, and Otter Creeks. These streams have base flow from the spring through fall seasons but are dry most winters. Brush Creek runs along the west side of the tract with Otter Creek on the east side. Surface runoff averages about one inch per year. Map 3 (Chapter I) shows the 100 year flood recurrence zone for Brush Creek. Table 3 shows estimates of the streamflow for the two intermittent streams.

TABLE 3
WATERSHED AREAS ON
THE SCHOOLHOUSE TRACT

Watershed	Area (Miles^2)	Discharge acre/feet	Peak Flow (cfs) 10 yr	Peak Flow (cfs) 25 yr
Brush Creek	22	1173	852	1369
Otter Creek	75	4000	1868	3039

Surface water quality is typically a sodium sulfate type. Suspended sediment concentrations are low. Surface water use within the tract is for wildlife and stock watering purposes.

The major regional aquifers that occur in this area are the Fox Hills - Hell Creek and the Upper Hell Creek - Lower Ludlow. In the shallow geology lignite and sand beds are aquifers in the Tongue River and Sentinel Butte formations. Within the mine disturbance zone only the Beulah-Zap lignite bed has sufficient water in it to be considered an aquifer. The degree of saturation of this bed varies from completely dry to partially saturated to saturated under confined conditions. In the northern part of the tract it is generally dry and not a major water source. There is no data for the southern portion of the tract but the water levels are believed to be higher and therefore the Beulah-Zap bed is more significant as a water source. Also in the southern part of the tract the Beulah-Zap bed underlies Brush Creek. The steady base flow recorded for Brush Creek indicates that it probably receives springflow from either the Beulah-Zap bed or another aquifer outcrop. Recharge to this system is from the local area and the ground water gradiants reflect topographic control. The major chemical quality constituents of this system are typically sodium, sulfate and bicarbonate. Ground water is used in the area for domestic and livestock watering purposes.

TABLE 1
SOILS - SCHOOLHOUSE TRACT

Map Symbol and Soil Mapping Unit Name[1/]	Percent Slope[1/]	Soil Erosion Potential[1/] Wind	Water	Overall Suitability of Soil for Use as Cover-Soil Material in Surface-Mine Reclamation[2/]	Soil Hazard Conditions[2/]
ARA/44 - Arnegard loam	1-3	Low	Low	Good	-----
ARA/44B - Arnegard loam	3-6	Low	Low-Mod	Good	-----
CbD - Cabba-Werner complex	9-15	Mod	Mod-High	Fair	Too alkaline; some lime
CbE - Cabba-Werner complex	15-40	Mod	High	Fair	Too alkaline; some lime
Chd/83E - Cohagen-Vebar fine sandy loam	6-35	High	High	Fair	Cohagen-too alkaline
FcB - Flaxton loamy fine sand	3-8	High	Mod	Fair	Too sandy
F1A - Flaxton-Livona fine sandy loams	0-3	High	Low	Good	----
F1B - Flaxton-Livona fine sandy loams	3-6	High	Mod	Good	-----
F1C - Flaxton-Livona fine sandy loams	6-9	High	Mod	Good	-----
FWA/95 - Flaxton-Williams loams	0-3	Mod	Low	Good	-----
FWB - Flaxton-Williams loams	3-6	Mod	Low-Mod	Good	-----
FXB - Flaxton-Williams soils	3-6	High	Low-Mod	Good	-----

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Map Symbol and Soil Mapping Unit Name[1/]	Percent Slope[1/]	Soil Erosion Potential[1/] Wind	Water	Overall Suitability of Soil for Use as Cover-Soil Material in Surface-Mine Reclamation[2/]	Soil Hazard Conditions[2/]
FXC - Flaxton-Williams soils	6-9	High	Mod	Good	-----
GaB - Grail silt loams	3-6	Low	Mod	Fair	Too clayey
MoC - Morton silt loam	6-9	Mod	High	Fair	Too clayey
MoD - Morton silt loam	9-12	Mod	High	Fair	Too clayey
NfB - Noonan-Flaxton soils	3-6	Mod-High	Low-Mod	Fair	Noonan-excess sodium
PbA/59B - Parshall fine sandy loam	0-6	High	Low	Good	-----
PcA - Parshall loam	0-3	Mod	Low	Good	-----
BcB/41B - Parshall loam	3-6	Mod	Low-Mod	Good	-----
RE - Regan silt loam	0-3	Low	Low	Fair	Too alkaline; some lime
RgC/9C - Regent silty clay loam	6-9	Low	High	Fair	Too clayey
RoB/87c - Rhoades-Daglum complex	0-9	Low	Mod	Poor	Too clayey; excess sodium and salts
SmC - Sen and Amor loams	6-9	Low-Mod	High	Good	-----
Sx/67 - Straw loam, channeled	0-6	Low	High	Good	-----
SY - Strongly saline land	0-3	Low	Low	Poor	Excess salts
VaC - Vebar fine sandy loam	6-9	High	Mod-High	Good	-----

TABLE 1
SOILS - SCHOOLHOUSE TRACT

Map Symbol and Soil Mapping Unit Name[1/]	Percent Slope[1/]	Soil Erosion Potential[1/] Wind	Water	Overall Suitability of Soil for Use as Cover-Soil Material in Surface-Mine Reclamation[2/]	Soil Hazard Conditions[2/]
VhD - Vebar-Cohagen fine sandy loam	9-12	High	High	Good	----
W1A - Williams loam	0-3	Low	Low	Good	-----
W1B/36B - Williams loam	3-6	Low	Mod	Good	-----
W1C/36C - Williams loam	6-9	Low	High	Good	-----
WnC - Williams-Flaxton loams	6-9	Mod	High	Good	-----
WzD - Williams-Zahl loams	9-12	Low	High	Good	-----
ZaD/39D - Zahl-Williams loams	9-15	Low	High	Fair	Too clayey; some lime
9B - Regent silty clay loam	3-6	Low	Mod	Fair	Too clayey
21B - Lihen loamy fine sand	1-6	High	Low	Fair	Too sandy
21D - Telfer loamy fine sand	6-15	High	Mod	Fair	Too sandy
22B - Krem loamy fine sand	1-6	High	Low	Fair	Too sandy
38C - Williams-Zahl loams	6-9	Low	High	Good	-----
40 - Shambo loam	1-3	Low	Low	Good	-----
51 - Straw silt loam	0-1	Low	High	Good	-----
57B - Flaxton fine sandy loam	1-6	High	Mod	Good	-----

TABLE 1
SOILS - SCHOOLHOUSE TRACT

Map Symbol and Soil Mapping Unit Name[1/]	Percent Slope[1/]	Soil Erosion Potential[1/] Wind	Water	Overall Suitability of Soil for Use as Cover-Soil Material in Surface-Mine Reclamation[2/]	Soil Hazard Conditions[2/]
58B - Flaxton-Williams complex	3-6	Mod-High	Low	Good	-----
58C - Flaxton-Williams complex	6-9	Mod-High	Mod	Good	-----
58D - Flaxton-Williams complex	9-15	Mod-High	High	Good	-----
71B - Searing loam	1-6	Mod	Low	Good	-----
74B - Regent-Rhoades complex	1-6	Low	Low-Mod	Fair	Too clayey; Rhoades-excess sodium and salts
77 - Bowdle loam	1-3	Mod	Low	Good	-----
81D - Cabba Loam	9-15	Mod	High	Fair	Too alkaline; some lime
81E - Cabba loam	15-35	Mod	High	Fair	Too alkaline; some lime
82E - Cabba-Badland complex	15-50	Mod	High	Poor	Cabba-too alkaline; some lime; Badland-lack of soil
86E - Wabek soils	3-25	Mod-High	High	Poor	Too sandy; droughty; excess small stones
89E/Md - Ustorthents	0-100	Highly variable	High	Poor	Too clayey; alkaline; excess sodium
91/91B - Straw loam	0-6	Low	High	Good	-----

1/ From "Soil Survey of Mercer County, North Dakota" and "Soil Survey of Oliver County, North Dakota".

2/ Derived by applying the properties of the soils which are described in the above mentioned soils survey reports and "Official Soil Series Description" to the guidelines developed by BLM-Montana State Office and adapted from information by Wm. Schafer, the Soil Conservation Service (SCS), and the Office of Surface Mining (OSM).

VEGETATION AND AGRICULTURAL PRODUCTION

The Schoolhouse tract is extensively used for agricultural purposes. Dryland farming methods, most notably alternate year summer fallow-cropping rotations, are widely practiced in the area. Thirteen percent (1,731 acres), (Mercer County and Oliver County ASCS, 1981) is fallowed each year (Table 4).

TABLE 4
AGRICULTURAL LAND USE
ON THE SCHOOLHOUSE TRACT

Land Use:	Tract Acres	Average Production Per Acre 1/	Total Annual Production
Cropland	3,339	25.2 bu.	84,143 bu.
Hayland	1,894	1.55 tons	2,936 tons
Range	5,243	.5 AUM	2,622 AUMs
Other	742	1.55 tons	1,150 tons
Fallow	1,731	n/a	n/a
Total	12,949 2/	n/a	n/a

1/ Crop : wheat equivalent bu./acre
Hayland: tons/acre
Range : AUMs/acre
Other : Tons/acre of hay

2/ Tract boundary was revised after completion of Agricultural Land Use analysis.

Small grains including spring wheat, oats, corn, barley, winter wheat, durum, flax, and sunflowers (in descending order of acreage grown) are grown on 24 percent (3,339 acres) of the tract. Wheat yields average 25.2 bushels per acre. Much of the cropland production, espicially the wheat portion, is sold as a cash crop. Oats, barley, and corn also are used as feed grains in livestock operations.

Fourteen percent (1,894 acres) of the tract is used for growing hay for use in overwinter livestock feeding. Approximately 1.55 tons of hay are produced per acre.

Thirty-eight percent (5,243 acres) is rangeland and pastureland. Rangeland produces about .5 Animal Unit Months per acre. An AUM is the amount of forage needed to support a cow/calf for one month. Beef cattle are the predominant kind of livestock (North Dakota Crop and Livestock Reporting Service, 1980). There are also some dairy cattle, hogs, and sheep.

There are approximately 20 acres of shelterbelts, field windbreaks, and farmsteads per operation. There are numerous woody draws in the tract which are populated by native trees and shrubs.

Except for reseeded rangeland, the rangeland is in the widespread Mixed Grass Prairie type (Shaver 1977). This includes species such as needle-and-thread, little bluestem, prairie sandreed, western wheatgrass, blue grama, side-oats grama, plainsmuhly, sedges, snowberry, fringed sagewort, and silver sage.

No threatened or endangered plant species as published on the 1980 list have been identified in the tract.

There are 27 operators and operator partnerships in the tract. Operations range in size from 40 acres to 1,400 acres inside the tract and from 320 acres to 6,040 acres in total (Table 5).

Agriculture in the area includes crop operations, livestock operations, and mixtures of both. Most operations in the area include a balance between crops and livestock.

Fifty-six percent of the operations have less than 30 percent of their lands within the tract, while 22 percent have more than 80 percent of their acreage within the tract. Overall, the tract covers 29 percent of the acreage of the operations involved.

Sixty-two percent of the acreage within the tract is farmed by lessees, or operators who do not own the land. Thirty-eight percent is farmed by owner/operators.

AGRICULTURAL ECONOMICS

This section will be forthcoming under separate cover.

LAND USE

The existing use on the Schoolhouse tract is primarily agricultural divided by minor roads along section lines. The area includes an existing strip mine in the northwest corner of the tract operated by the Knife River Coal Company on two federal leases. The area is crossed by State Highway 49, a 16" pipeline approximately bisecting the tract and running in a northwest/southeast right-of-way and high voltage power lines run in a northeast/southwest direction through the northwest tip of the tract.

Other land use includes a cemetery to the south of the strip mine in the northwest corner of the tract, a borrow pit and an abandoned mining site.

The region and local area is largely agricultural but includes both active and abandoned strip and underground coal mines. The closest population center is Beulah (pop. 2,878), a primarily residential community.

RECREATION

Hunting of a variety of species (deer, upland game birds, waterfowl) is the only recreational opportunity

TABLE 5
FARM/RANCH OPERATIONS - SCHOOLHOUSE TRACT

	INSIDE COAL TRACT (ACRES)							OUTSIDE COAL TRACTS (ACRES)							
OPERATOR	SMALL GRAIN CROP	HAY	GRAZING	SUMMER FALLOW	OTHER	TOTAL	PERCENTAGE OF TOTAL ACRES LEASED	SMALL GRAIN	HAY	GRAZING	SUMMER FALLOW	OTHER	TOTAL	GRAND TOTAL	PERCENTAGE OF TOTAL ACRES IN TRACT
1	0	186	94	0	0	280	100	0	211	1302	0	0	1513	1793	16
2	219	166	642	219	154	1400	60	33	7	127	33	40	240	1640	85
3	0	39	232	0	449	720	0	0	0	68	0	12	80	800	90
4	13	4	39	13	11	80	0	58	51	110	21	0	240	320	25
5	103	102	167	28	0	400	100	645	211	1838	103	0	1797	3197	13
6	347	298	560	115	0	1370	39	484	0	243	160	0	887	2207	60
7	273	228	150	109	0	760	0	0	0	40	0	0	40	800	95
8	143	22	131	143	121	560	100	338	456	941	0	0	1735	2295	24
9	282	46	469	123	0	920	100	18	12	124	6	0	160	1080	85
10	230	5	82	163	0	480	67	181	151	500	128	0	960	1440	33
11	82	94	144	0	0	320	0	186	443	1531	0	0	2160	2480	13
12	58	0	8	54	0	120	100	527	0	409	504	0	1440	1560	7
13	241	9	362	108	0	720	100	79	14	31	46	0	170	890	81
14	405	206	389	309	0	1309	90	232	67	747	177	0	1223	2532	52
15	78	43	45	34	0	200	20	232	25	396	101	0	760	960	21
16	0	0	40	0	0	40	100	134	60	326	80	0	600	640	6

TABLE 5
FARM/RANCH OPERATIONS - SCHOOLHOUSE TRACT

	INSIDE COAL TRACT (ACRES)							OUTSIDE COAL TRACTS (ACRES)							
OPERATOR	SMALL GRAIN CROP	HAY	GRAZING	SUMMER FALLOW	OTHER	TOTAL	PERCENTAGE OF TOTAL ACRES LEASED	SMALL GRAIN	HAY	GRAZING	SUMMER FALLOW	OTHER	TOTAL	GRAND TOTAL	PERCENTAGE OF TOTAL ACRES IN TRACT
17	0	160	0	0	0	160	100	161	136	185	0	0	480	640	25
18	75	75	170	0	0	320	100	1101	414	3390	0	0	4905	5225	6
19	35	0	105	20	0	160	100	650	64	419	376	0	1509	1669	10
20	59	61	294	59	7	480	0	315	137	156	315	37	960	1440	33
21	337	40	89	174	0	640	100	139	16	13	72	0	240	880	73
22	10	29	41	0	0	80	0	79	27	294	0	0	400	480	17
23	0	0	40	0	0	40	0	76	65	312	30	0	480	520	8
24	45	13	86	16	0	160	0	150	72	782	51	0	1055	1215	13
25	243	58	564	15	0	880	86	0	0	320	0	0	320	1200	73
26	61	10	220	29	0	320	0	0	0	0	0	0	0	320	100
27	0	0	80	0	0	80	100	207	603	5046	104	0	5960	6040	1
TOTAL	339	1894	5243	1731	742	12,949	62	6031	3242	19,648	2307	89	31,314	44,263	29

offered to the public on the tract. This opportunity, while significant to local people, has limited attraction to people outside the immediate vicinity of the proposed mining.

The community of Beulah, North Dakota offers recreational opportunities in the general vicinity of the tract. Ball diamonds, parks, a swimming pool along with golf, tennis and gymnasium facilities offer adequate opportunities at this time. Lake Sakakawea, north of the tract, offers state and federal recreational opportunities.

AESTHETICS

The existing character of the land is largely agricultural as noted in other sections of this document. The appearance of the area is constantly changing following the progression of agricultural activity through the seasons and the cycle of active cropping and fallow. Fields are well defined rectangles in a north/south, east/west grid divided by roads on most section lines and also by wind rows, fences, and shelterbelts. Interspersed variations such as small patches of broken ground, grazed prairie and woody draws can be found in the tract area.

Manmade features are a part of the character of the landscape. In the vicinity of this tract a gravel pit, power lines and agricultural structures and facilities are evident. In the region coal mining is evident and is accepted locally as part of the land. On the tract, strip mining is highly visible because Highway 49 runs through the area of active mining. Views from this highway may be judged poor. Mining is presently not visible from the largest population center in the immediate area, Beulah.

WILDLIFE

The operating mine has eliminated about 14 percent of the native prairie, woodlands, wetlands, and farmlands within the tract. This amounted to 2161 acres by August, 1980. The balance of habitat is comprised of wetlands-2 percent, woodlands-2.5 percent, native prairie-22.5 percent, and agriculturally disturbed-59 percent.

Otter Creek bounds the coal tract on the east, Coyote Creek on the west, and Brush Creek bisects it as it flows northwest into the Knife River on the north.

The essential habitat for 31 sensitive wildlife and more common species are wetlands and woodlands, interspersed with native prairie (Map 3, Chapter I).

These essential habitats provide the necessities of life for 31 species throughout the biological year (Table 6). Whooping crane, an endangered species, migrates through this area and use the wetlands. Wetlands, specifically prairie potholes, are the most productive wildlife habitat in North Dakota.

This area was glaciated, and farming has encompassed all but remnant areas which now support the majority of the best wildlife habitat. The interspersion of essential habitat provides the greatest amount of edge, has the highest wildlife diversity, and largest populations.

All remaining native grasslands represent precious relics of the original prairie ecosystems. They evolved during thousands of years and, once destroyed, cannot be exactly duplicated by man. The rate of native prairie loss in North Dakota has been tremendous; unplowed prairie exists in only 20 percent of the original total.

There are no sensitive fish, amphibians, or reptiles identified in this area at this time. There are sensitive fish in the Knife River and the Missouri River downstream. Brush, Coyote, and Otter Creeks may support the Lake Chub as well.

CULTURAL RESOURCES

There are indications that both historic and prehistoric resources will be recorded from the logical mining unit when it is inventoried. To date, no systematic survey has been conducted. Therefore, specific comments cannot be made.

Cultural resources information has been collected from areas within a 20 mile radius of the tract. Where this collection has taken place, human activity from prehistoric through historic time has been recorded. This activity is generally reflected in open plains sites that are task specific and exploitative in nature (i.e., bison kill sites; lithic scatters of varying size, density and function; seasonal and long term habitation sites).

The rolling plains in the area are an ideal location for the short term occupations that are seen in the cultural resources from the tract. Short trips to exploite a variety of resources from the area is seen in the pattern of prehistoric resources that have been recorded. This pattern is likely to emerge as cultural resources are found. Also, it is not likely that resources recorded in the future would prevent coal mining, from the tract.

The dominant human use of the area in the historic period has been farming. Stock raising has been a minor use. Most evidence of historic activity is oriented toward farming activity. This activity, which continues to the present time, has possibly eradicated cultural resources from earlier times.

ECONOMIC AND SOCIAL CONDITIONS

Existing and forecasted population and employment levels for the communities of Beulah, Hazen, Zap, Bismarck and Mandan, North Dakota are shown in Figure

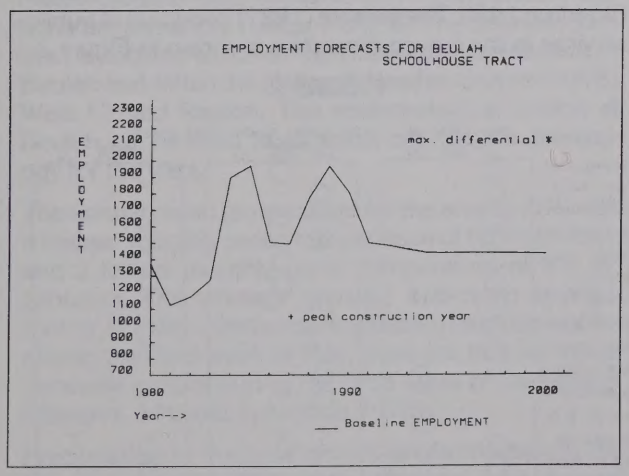
TABLE 6
WILDLIFE HABITAT AND SPECIES

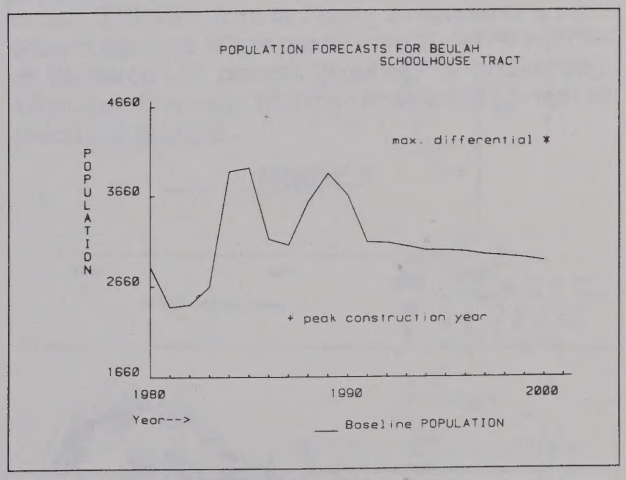
Woodlands	Wetlands	Native Prairie	Agriculturally Disturbed
*Sharptail Grouse	*Hungarian Partridge	*Sharptail	Sharptail
*Hungarian Partridge	Mourning Dove	Hungarian Partridge	Hungarian Partridge
*Mourning Dove	*Pheasant	Mourning Dove	Mourning Dove
*Pheasant	*Mallard	*Whooping Crane	Pheasant
*Merlin	*Gadwall	*Merlin	Whooping Crane
*Swainson's Hawk	*Whooping Crane	Swainson's Hawk	Swainson's Hawk
Marsh Hawk	*Pintail	Marsh Hawk	Marsh Hawk
Ferruginous Hawk	*Greenwing teal	*Burrowing Owl	Ferruginous Hawk
*Loggerhead Shrike	*Widgeon	*Ferruginous Hawk	Whitetailed Deer
*Whitetailed Deer	*Shoveler	Loggerhead Shrike	Red Fox
*Mule Deer	*Redhead	Whitetailed Deer	Badger
Mink	*Canvasback	*Mule Deer	No. Swift Fox
Beaver	*Ruddy	*Antelope	
Red Fox	*Sandhill Crane	Mink	
Badger	*Swainson's Hawk	Red Fox	
No. Swift Fox	*Marsh Hawk	*Badger	
*Bobcat	*Sprague's Pipit	*No. Swift Fox	
	*Whitetailed Deer	Bobcat	
	*Muskrat		
	*Mink		
	*Beaver		
	*Red Fox		
	Badger		

*Essential habitat for species

1 (Mountain West 1981). As can be seen from this figure, future population levels without federal coal leasing show considerable fluctuation through the early 1990's due to the construction of energy projects not directly related to the leasing of federal coal.

FIGURE 1





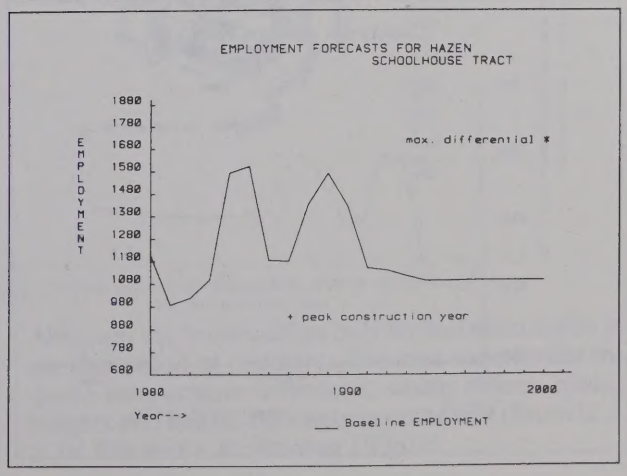
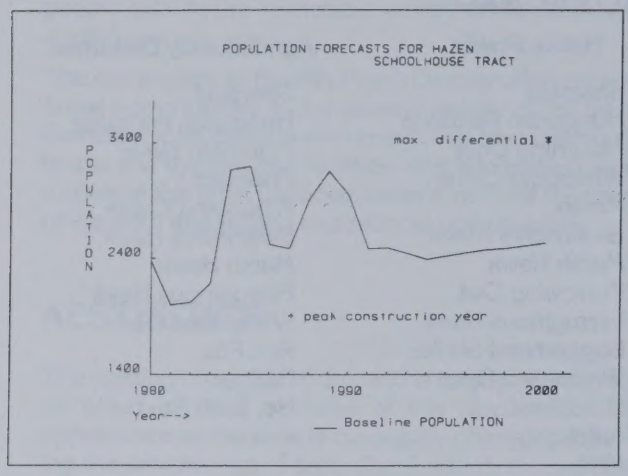
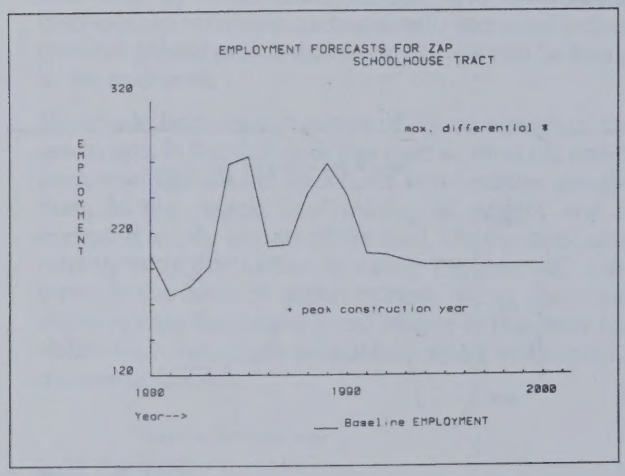
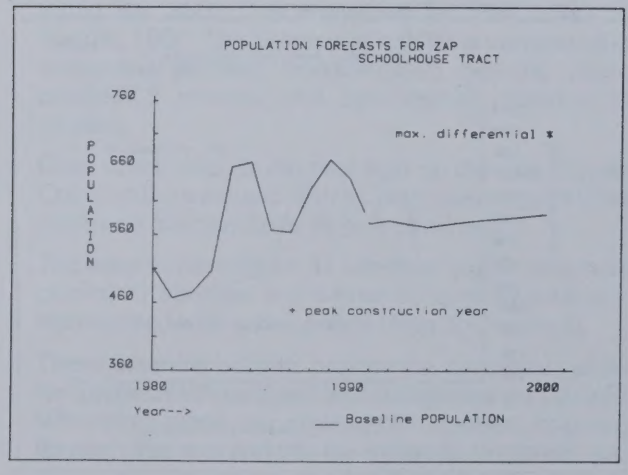
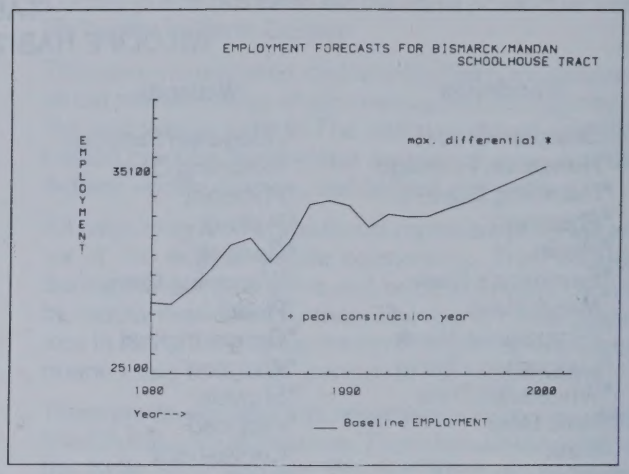


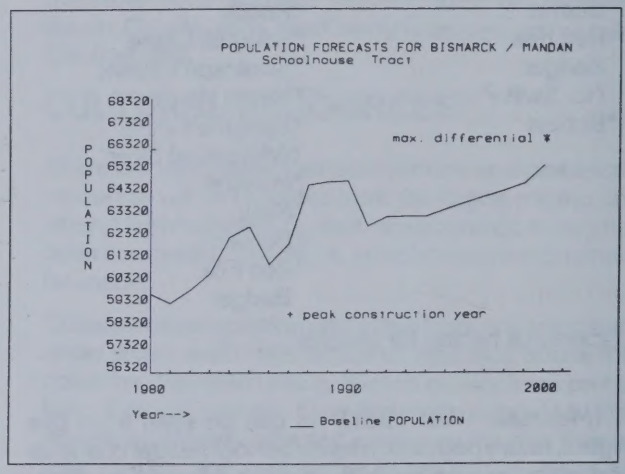
FIGURE 1 (continued)







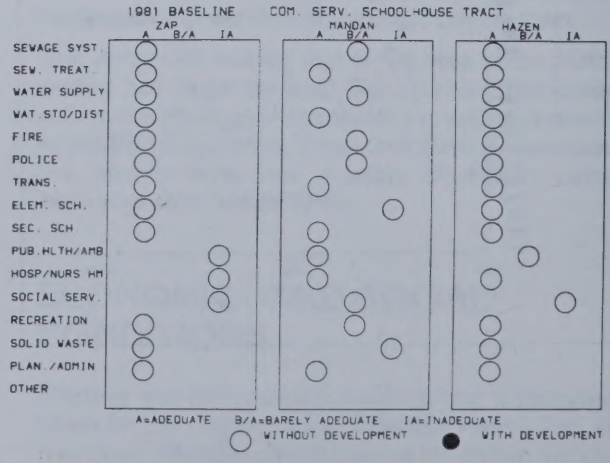




SOURCE: Mountain West Research, Inc., 1981.

The majority of the Beulah mine (with which the Schoolhouse tract is associated) employees currently reside in Beulah, Hazen, Zap, Bismarck, and Mandan (Waldrun 1981). The present (1981) condition of public services in the five communities is shown in Figure 2.

FIGURE 2



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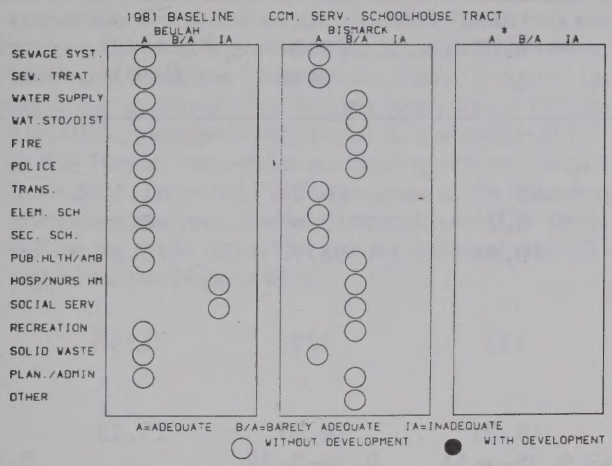


SOURCE: Respective city/county or regional planners.

The adequacy ratings in Figure 2 reflect assessments by city and county planners. It should be recognized that some assessments were based on best judgment and are somewhat subjective.

CLIMATE AND AIR QUALITY

The climate of western North Dakota is typically continental, characterized by variable temperature and precipitation. The predominant pressure systems, out of the Gulf of Mexico and the Arctic, account for the rapid alterations of meteorological conditions common to the area. Cold polar air masses dominate the winter months, while moist Gulf air masses prevail in the spring and summer, distributing the major precipitation across the area.

Meteorological data available from surrounding stations are shown in Tables 7 and 8. The Schoolhouse tract is located south of the meteorological station at Beulah and within the National Weather Service (NWS) West Central Region. The meteorological station at Beulah will be used to establish benchmark climatology for the tract.

The annual mean temperature for the area is 41°F with a highest monthly mean temperature of 68°F (in July), and a lowest monthly mean temperature of 8°F (in January). The average growing season is approximately 121 days; the last spring freeze generally occurs during the third week of May, while the first fall freeze generally occurs during the third week of September (Ramirez, J.M. and T. Method 1976).

Precipitation in the area occurs predominately in the late spring and early summer (May to July). Annual precipitation averages 17.20 inches at Wibaux, and 16.91 inches through the NWS West Central Region. The average annual snowfall at the Beulah station is 27 inches.

TABLE 8
REPRESENTATIVE REGIONAL METEOROLOGICAL DATA

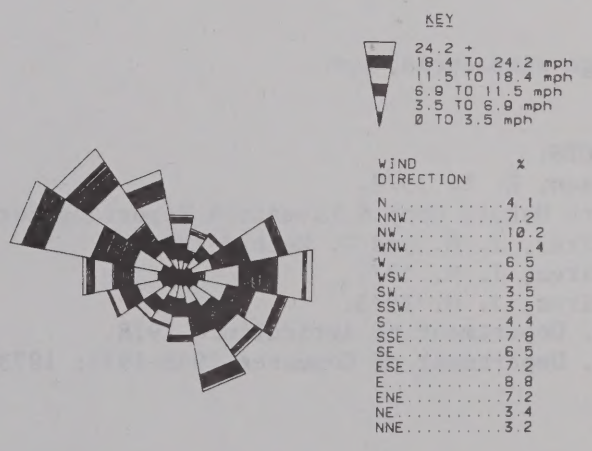
	Regional Values
Humidity (Annual Average), %	40-50
Lake Evaporation (Annual Avg.), in.	50-55
Extreme Weather	
Thunderstorms, days/year	30
Tornadoes, sightings/year	rare
Hail, days/year	2-4
Maximum recorded wind speed, mph*	72
Inversion Frequency (base 1500 ft.), %	
Annual	35
Seasonal Range	30-50
Mixing Height, ft.	
Mean Annual Morning	984-1312
Mean Annual Afternoon	4921-5249
Mean Seasonal Afternoon Range	1968-7874

*Recorded at Bismarck, North Dakota

Sources:
Brum, L.J., J.W. Enz and J.M. Ramirez 1978.
Jensen, R.E. 1974.
Ramirez, J.M. and T. Method 1976.
U.S. Department of Commerce 1974.

Wind data used for this analysis were obtained from the Bismarck climatological station, the nearest station to the tract with data suitable for input into the dispersion model. The wind rose in Figure 3 represents a summary of this data. Winds prevail from the WNW to NNW at Bismarck (29 percent frequency of occurrence). Wind speeds average 10.2 mph and exceed 11.5 mph 36 percent of the time.

FIGURE 3



WIND ROSE FOR BISMARCK NORTH DAKOTA

Although the terrain offers only limited obstruction to the dispersion of pollutants, the area experiences frequent temperature inversions, which reduce mixing heights and tend to concentrate pollutants (Brum L. J., J. W. Enz and J. M. Ramirez 1978).

TABLE 7*
METEOROLOGICAL DATA FOR SELECTED SITES

Parameter	Beulah	Center	Washburn	Dunn Center	Bismarck (WSO)	NWS West Central Region
Temperature, °F						
$\bar{X}$ annual, °F	40.6	40.5	41.9	40.2	41.4	40.6
$\bar{X}$ monthly low (Jan)	7.6	8.5	8.2	7.9	8.2	8.4
$\bar{X}$ monthly high (July)	69.3	69.0	70.8	68.7	70.8	69.4
Average growing season (temp. 32° F), days	121	117	133	122	133	120
Precipitation, in.						
Annual average	17.20	17.45	18.01	16.57	15.15	16.91
Monthly range	0.32-3.35	0.48-3.55	0.35-4.11	0.36-3.72		0.40-3.92
Annual snowfall	27	29.8	30	34	40	30
Annual stability, (by class)						
% occurrence						
Class A, B, C					14.3	
Class D					56.4	
Class E, F					29.3	
Wind direction, (%)					W-NW(28)	
Wind speed, mph (% of time)					0-3.5 (4)	
					3.6-6.9 (13.4)	
					7-11.5 (30.5)	
					11.6-18.4 (39.1)	
					18.5-24 (11.3)	
					>24 (1.6)	
Average wind speed, mph					10.8	

*SOURCES:

Jensen, R. E. 1972.
North Dakota Crop & Livestock Reporting Service 1980.
Ramirez, J. M. and T. Method 1976.
Ramirez, J. M. 1972.
Ramirez, J. M. 1973.
U.S. Department of Agriculture 1978.
U.S. Department of Commerce 1948-1974; 1973; 1974; 1979.

Table 9 presents some of the available air monitoring data from ambient air monitoring stations in the general vicinity. Recorded annual geometric mean concentrations for total suspended particulates (TSP) from area rural locations have ranged from 15 ug/m^3 (at Garrison) to 32 ug/m^3 (at Beulah, rural). From 1974 to 1980 the annual geometric mean concentration of TSP at the Beulah residential monitoring station ranged from 28 to 61 ug/m^3. For the purpose of the following computer analyses, the background rural TSP levels will be set at 24 ug/m^3 for the annual level and 100 ug/m^3 for the 24-hour level.

Three Class I areas, the North and South Units of Theodore Roosevelt National Park and the Lostwoods National Wilderness Area, fall within the potential impact range of the proposed tract and associated developments. Based on 1979 air quality computer modeling estimates by the North Dakota State Department of Health, the allotted 24-hour SO_2 increment for the South Unit of the Park is consumed, or nearly consumed.

TABLE 9
WEST CENTRAL NORTH DAKOTA AIR MONITORING DATA*

Monitoring Site	Year	Parameter	No. Observations	Max. Observation (ug/m^3)	2nd Max. Observation (ug/m^3)	Annual Geom. Mean (ug/m^3)	Annual Arith. Mean (ug/m^3)
			State-Operated Sites:				
Beulah (rural)	74	TSP	10	488	47	26	69
	75	TSP	39	171	141	24	37
	76	TSP	51	81	61	24	29
	77	TSP	58	224	73	24	31
	78	TSP	52	288	258	32	52
	79	TSP	28	82	78	22	28
Beulah (residential)	74	TSP	32	1781	161	28	91
	75	TSP	48	151	126	34	41
	76	TSP	61	148	136	49	59
	77	TSP	58	290	149	45	55
	78	TSP	19	284	124	51	68
	79	TSP	45	214	197	51	67
	80	TSP	55	630	204	61	78
		SO_2	5517	104	73	<5	<5
Dunn Center (rural)	79	TSP	4	37	17	16	19
		SO_2	1896	78	26	13	13
	80	TSP	33	58	52	22	25
		SO_2	7332	52	39	<5	<5
Stanton (rural)	76	TSP	61	150	104	31	39
	77	TSP	60	237	90	24	32
	78	TSP	58	104	67	19	24
	79	TSP	42	90	80	19	25
			Privately-Operated Impact Source Monitoring Sites:				
Ramp #1 Beulah	79	TSP	11	161	93	57	69
		SO_2	1403	78	65	<5	<5
	80	TSP	59	642	125	24	41
		SO_2	6250	81	63	<5	<5
Ramp #2 Beulah	79	TSP	11	76	74	42	47
		SO_2	1401	73	52	<5	<5
	80	TSP	57	613	156	25	45
		SO_2	6251	91	84	<5	<5
Ramp #3 Beulah	79	TSP	11	1000	114	85	158
		SO_2	1403	47	39	<5	<5
	80	TSP	58	141	96	26	34
		SO_2	6239	148	107	<5	<5
Ramp #4	79	TSP	11	121	120	70	81
		SO_2	1403	102	63	<5	<5
	80	TSP	41	523	161	24	45
		SO_2	4141	165	151	<5	<5
Ramp #5	79	TSP	11	129	89	45	56
		SO_2	1404	37	31	<5	<5
	80	TSP	59	707	126	21	41
		SO_2	6164	60	57	<5	<5
Knife River (North)	80	TSP	27	161	53	26	33
Knife River (East)	80	TSP	24	134	60	22	30
Knife River (West)	80	TSP	13	48	47	19	23

*SOURCE - NORTH DAKOTA STATE DEPARTMENT OF HEALTH

CHAPTER III
ENVIRONMENTAL CONSEQUENCES

TOPOGRAPHY

The natural contour of about 1861 acres of land over unleased federal coal would be modified during surface mining. In total 10,843 acres would be disturbed during the assumed 48-year mine life. Although most would be returned to its approximate original contour, difference in detail would remain, including drainage patterns and final sloped highwalls. These changes would alter natural erosional patterns, which in turn could modify rates of gully cutting and sediment yield, depending on the effectiveness of reclamation.

In general, the reshaped ground would not be steep enough to cause slope failures and related hazards. Until such time that natural vegetation can be reestablished, accelerated sediment yield and unsightly scars on the land would be potential problems.

GEOLOGY AND MINERALS

The major impact of the leasing alternative would be the addition of 38.7 million tons of recoverable federal coal to the reserves available for mining. Approximately 27 million tons has been leased. These reserves would be bypassed if not leased. Mineral resource conflicts might occur between development of oil and gas and of the coal since there is at least some potential for finding oil and gas on the tract.

SOILS AND RECLAMATION POTENTIAL

The types of impacts affecting the soil resource in this area have previously been discussed in BLM planning efforts and the Draft West-Central North Dakota Regional Environmental Impact Study. Briefly, the basic impacts are the disruption of the present soil bodies with temporary loss of productivity and problems with erosion, compaction, and instability.

Soil erosion and compaction would not be new to the area because dryland agricultural activity and coal mining already exist in the tract. About 13 percent of the tract is annually left bare of protective cover due to summer fallowing. Erosion and compaction increase during soil handling operations but decrease during other stages of mining. Reducing wind erosion on the sandier textured soils and guarding against excessive water erosion on the steeper slopes breaking into the drainageways are the primary areas of concern. Protective measures such as mulching and seeding quickly growing cover crops are extremely important to avoid serious soil loss during reclamation.

Some instability problems would probably appear with the onset of reclamation. Area-wide settling, localized subsidence or collapse, and underground erosion called piping may occur (Groenwald, 1980). However, if the required stipulations covering the handling of soils and overburden during surface mining operations are closely adhered to and enforced, these impacts should be kept minimal. The gentle slopes over most of the area aids in the workability of material and makes corrective measures on problem spots easier to carry out.

The soils would be lost to the production of grass, forage, grain, etc. over the short-term use (about 10 years for each given acreage—annual disturbance of 270 acres) of the tract for coal mining. This loss occurs only on the active portion of the mine at any given time. Once in full operation, the total area out of production in any given year is estimated at about 2,720 acres. Soils are continuously replaced on mined out areas and brought back into production during the life of the mine (48 years).

Preliminary indications from completed and ongoing research by such agencies as the Science and Education Administration—Agricultural Research of Mandan, North Dakota and North Dakota State University—Agricultural Experiment Station of Fargo are that agricultural productivity of mined land can be restored. Much depends, however, on the planning and implementaion of a concerted reclamation effort (Power 1974). The chance for successful return of agricultural productivity in this area is high. Soils Table 3 in Chapter II indicates that individual landowners have sufficient supplies of soil rated good and fair for use as cover soil material in surface mine reclamation.The acreage rated poor for soil suitability might have productivity increased by averaging suitable plant growth material over the area.

HYDROLOGY

During mining all of the surface runoff from the disturbed area must be impounded and not released until it meets specified quality standards. An exception to this is when storm runoff exceeds the design capacity of the reservoir. Flooding of any of the intermittant streams in this area while digging or stockpiling is occurring within the floodplain may significantly impact the quality of the Knife River. Avoiding disturbances and not stockpiling soil and overburden within the 100 year flood recurrence zone and properly designing road crossings would mitigate this impact. Most of the floodplains do not have strippable coal beneath them.

As the lignite is mined an aquifer would be removed

while the mine pits are open, water levels in the lignite aquifers would be drawn down in the area surrounding an open pit. The distance from an open pit that drawdown would occur is variable and dependent upon the local aquifer characteristics.

The physical disturbance caused by mining would also result in changes in the chemical quality of the local groundwater. Increases in sodium, sulfates and total dissolved solids concentrations have been reported by Groenwald (1979 and 1980) at other mines in North Dakota with similar overburden. The changes in water quality were variable but dependent upon overburden characteristics and reclamation practices. The quality of water in the replaced overburden would be similarly degraded. In the northern part of the tract groundwater impacts would be limited. In the southern portion there may be some interaction between the lignite aquifer and the base flow of Brush Creek. There is insufficient data at the present time to say whether or not the baseflow of Brush Creek would be affected. This base flow is very limited so no significant impact should occur to the Knife River.

There are about fifteen rural water users that could be affected by impacts to the groundwater system. Replacement water supplies are available in deeper aquifers.

VEGETATION AND AGRICULTURAL PRODUCTION

The proposed action would progressively remove an average of 270 acres of the total tract area per year from its current uses. The major use of these lands is agricultural production. The first land taken out of agricultural operations, except for the plant site and ancillary facilities, will occur in the first year of mining. The time period of removal from agricultural production would be the time spent in mining and land reclamation. The entire tract would be progressively mined over a 48 year period.

Mining of any one location would be the land use for one to five years, depending on the type of mining. Land reconstruction to premining levels of agricultural production would require a total of approximately ten years. The land would be placed into the premining type of agricultural production or other premining uses that the landowner and Public Serivce Commission agree upon (wildlife habitat, woodlands, or rights-of-way). Vegetation reestablishment would occur during the first appropriate season after grading to topography and replacing topsoil.

The company would be under bond for at least ten years to as long as necessary to prove, at a 90 percent confidence level, that agricultural productive capacity has been restored to equal or better than it was before mining (Public Service Commission, Reclamation Department, 1980). Reclamation research by such agencies as the Science Education Administration—Agricultural Research Service and North Dakota State University—Agricultural Experiment Station indicates that some degree of optimism for the restoration of land to agricultural production is justified, although there is no certainty as to how long it would be before all mined land would be judged as fully restored as the law requires.

The leasing and development alternative would have a significant short-term impact on individual agricultural operations in the tract. By the end of the 48 year mine life, 12,949 acres of the tract would be disturbed in addition to 160 surface acres used for existing mine facilities.

An average of 86 acres of cropland, excluding 1,731 total acres of summer fallow, would be removed from production each year. This would be an average annual loss of 2,167 bushels of wheat. This 86 acres of cropland would be out of production ten years with a maximum of 857 acres out of production in any one peak mining year, resulting in a maximum loss of 21,596 bushels of wheat annually.

Peak mining years disturbance of 398 acres of hayland would result in an annual loss of 617 tons of hay production.

An average of 111 acres of rangeland would also be removed from production each year, resulting in an average loss of 56 AUMs. This 111 acres of rangeland would be out of production ten years with a maximum of 1101 acres out of production in any one peak mining year, resulting in a maximum annual loss of 551 AUMs.

Regionally, these losses would not pose significant reductions in area agricultural production.

Time constraints necessitated the Bureau of Land Management's doing agricultural data collection on the preliminary logical mining unit instead of the later final logical mining unit. The data may not completely represent the logical mining unit in its final form.

Some of the more sensitive plants (for cropland, woodland, or rangeland use) may have difficulty in becoming established on some of the less suitable soils.

AGRICULTURAL ECONOMICS

This section will be forthcoming under separate cover.

LAND USE

Existing land use within the tract boundaries shall be physically displaced for up to ten years during the period of active mining and reclamation. Adherence to

state and federal law and regulation implies that existing use may be restored. The pipeline, utilities and roads shall either be bypassed or relocated during the period of mining operations creating minor inconvenience locally.

Expansion of the mine and increased population associated with this expansion would affect nearby communities. New residences, public facilities and private services would displace other use, principally agricultural, in the vicinity of towns. The town of Beulah is likely to be most affected by demographic changes resulting from mine expansion.

RECREATION

Habitat destruction and the resulting loss of wildlife species (deer, upland game birds, waterfowl) would damage recreational hunting. From the recreational perspective, it is likely the loss would be manageable.

Social and economic studies have documented demographic changes resulting from mining that would stress Beulah, North Dakota, and other communities in the vicinity of the tract. This stress would be felt on the available recreational facilities in the communities. Outside of the communities, increased pressure would be seen on private and public land because of recreational opportunities lost to mine related impacts.

AESTHETICS

Views from Beulah would remain unaffected. Coal mining from Highway 49 would continue to be undesireable but in the long term would not degrade if state and federal law is adhered to. The traffic load on Highway 49 is modest. Though service quality has been severely impaired and new areas would be affected, albeit temporarily, in a similar fashion, the effect perceptually would be almost negligible.

WILDLIFE

Coal mining and attendent actions would severely disrupt and destroy significant native prairie interspersed with woodlands, and wetlands, which singly and in composite constitute the essential habitats for 31 sensitive wildlife species and many other more common wildlife. The farmed land totaling 59 percent of the area provides no essential habitat for wildlife, although it is used by numerous wildlife throughout the year.

On-site effects to wildlife resources would be degradation and loss of the three essential habitats. Off-site aquatic habitats in Otter Creek, Knife River and the Missouri River would be the recipient of potential point and non-point pollution.

There would be a significant areawide loss to wildlife resources if strip mining occurs in the essential wetlands, woodlands, and native prairie.

Mobile wildlife such as birds and large mammals may shift about the habitat losses to some degree, but non-mobile species such as reptiles and amphibians would be destroyed. The very limited availability and disruption of riparian woodlands and wetlands would restrict, and in many cases exclude, the accommodation of disturbed mobile wildlife.

Noise, presence of humans, heavy equipment, dust and affiliated disturbances cumulatively may cause wildlife to vacate adjacent unmined habitats and may preclude adoption by wildlife of those rehabilitated areas until the disturbances are eliminated. This may be for the life of the mine and rehabilitation period, which may be as long as 30 or more years.

Increased human populations resultant of mine development and operations generally reduce wildlife populations and habitat locally and offsite by poaching, road kills, increased legal harvest, disturbance during reproductive and migratory periods, harassment by recreationists, photographers, feral and uncontrolled cats, dogs, and degradation and complete loss of habitat due to housing, shopping centers, waste treatment plants, and similar urban development. The problem is compounded in areas where shift changes of workers coincide with feeding periods, especially big game. The same would probably occur in this area.

Actions to mitigate these impacts available to entities other than BLM, would be to provide mass transportation of workers and adjust the times of shift changes which would greatly reduce poaching. This has been used successfully in other mining areas. Providing funds for the North Dakota Game and Fish Department for increased law enforcement or adoption of a poaching clause in union contracts would also help

Successful reclamation of native woodlands and natural wetlands such as "potholes" and riverine wetlands has not been demonstrated. Native prairie has not been successfully reclaimed either although some prairie plowed about 70 years ago and since left undisturbed shows some native plant reestablishment.

Concurrent reclamation of lost wildlife habitat within 12 to 18 months after mining may reduce a few of the lesser negative wildlife impacts. However, disruption or loss of any of the larger wetlands and riparian woodlands is expected to become a permanent loss.

At present there is no information to suggest that natural, biologically viable wetlands (e.g., potholes) can be reclaimed from mine spoil in this country. It would be most productive and conservative to eliminate mining from the larger wetlands thereby retaining the critical soils structure of the wetlands and eliminating the extended delay proposed for wetlands reclamation attempts. Destruction of natural viable wetlands by strip

mining under the present state of biological and hydrological knowledge would be an irretrievable commitment of wildlife resources.

An interagency team of Wildlife Biologists from the North Dakota Game and Fish Department, U.S. Bureau of Land Management have identified and recommended areas for the application of unsuitability criteria (Map 3, Chapter I). Formal recommendations have been received by BLM from both agencies. Joint agreement between the agencies and final decisions on unsuitability exemptions (such as producing leases) and exceptions will be completed in August.

CULTURAL RESOURCES

All cultural resources within the tract boundaries are subject to direct and indirect impacts. Direct impacts are those that result from ground disturbance activities and can result in damage and destruction to sites, artifacts, their environmental context and the data they contain.

Sites not directly impacted by earth disturbance may be impacted as a result of the earth disturbance. These secondary impacts can include vandalism increased by improved access, loss as a result of erosion or degradation resulting from disruption or natural setting.

In the event of lease, stipulations covering cultural resources would have to be developed. These stipulations would have to treat both recorded and unrecorded sites. They would also have to require management plans for cultural resources that detail mitigation plans for each site to be impacted. As in any cultural resources mitigation, preservation alternatives are preferred. If these options are not viable, then scientific data recovery programs would have to be developed.

ECONOMIC AND SOCIAL CONDITIONS

The Knife River Coal Mining Company plans to increase production from 2.2 million to five million tons annually in 1995. This expanded production amounts to approximately 120,000 tons per year of federal coal and approximately 730,000 tons per year of state and private coal.

New employment due to the expanded production would be insignificant and primarily limited to loading crews and truck drivers.

Due to this small increase in employment, population increases in the surrounding communities would also be small. This would result in no significant impacts to community services or changes in social conditions.

The only effect of leasing on community services would be a continuation of the existing level of demand for these services for an additional 48 years (life of the mine). The existing condition of public service in communities where mine employees reside were shown in Figure 2 (Chapter II).

Technical reports are available which discuss the methodology used in the economic or social analysis.

NET ENERGY ANALYSIS

A net energy analysis was calculated using the guidance contained in BLM Washington Office Information Memo 80-640, July 17, 1980. Approximately 37.7 British thermal units (Btus) would be expended to produce a pound of coal. That pound of coal, in turn, would produce about 6919 Btus. The ratio of energy produced to that expended is 183 Btus/1Btu.

CLIMATE AND AIR QUALITY

Impacts on climate from the proposed action cannot be addressed specifically. This is due to a lack of technical information and research work on the topic of potential impacts on climate. However, general climatic influences applicable to the proposed development can be discussed.

The modification of surface contours and albedo due to redistribution of soils and removal of vegetation may produce slight localized changes in wind speed and direction, temperature, and humidity. Impacts associated with the increased particulate emissions could also alter local climatic conditions. Reclamation with reestablishment of vegetation and a stable landscape should largely mitigate these impacts over the long-term.

The methodology for determining the air quality impact of particulate emissions consists of: 1) obtaining mine profiles for the tract from the BLM; 2) obtaining emission factors for individual surface coal mining operations; 3) using the mine profile and emission factors for calculation of total emissions; 4) entering the emission data into a modified climatological dispersion model (CDMQC) for prediction of ambient concentrations; and 5) comparing predicted concentrations to Federal and State Ambient Air Quality Standards and to Prevention of Significant Deterioration (PSD) increments. The air quality impact was analyzed for the proposed tract's peak production period.

Details about the CDMQC model, emission factors, and their application appear in the technical report (separate cover).

The results of the modeling analysis were plotted on an isopleth map. The predicted concentrations were then

compared with applicable air quality standards. The 1970 Clean Air Act Amendments establish primary and secondary National Ambient Air Quality Standards (NAAQS). North Dakota established air quality standards in 1969. The present Federal and State ambient air quality standards are shown in Table 10.

All pollutant sources must be evaluated to determine if PSD regulations apply. Preliminary evaluations indicate that the proposed coal mine's product emissions (coal dust) would be less than 250 tons/year; therefore, the coal mine is not a PSD source. However, the State PSD regulations specify that if the fugitive dust emissions cause the total potential particulate emissions to be in excess of 250 tons/year, then the source consumes PSD increment (i.e., these sources do not have to meet PSD regulations, but, the emissions from these sources are counted against PSD increment). Table 11 shows Federal and State PSD standards.

During peak production of the mine an estimated 1,847 tons per year would be emitted, with the best available control technology applied. Fugitive dust sources would account for 96 percent of the peak production emissions.

Dispersion modeling was performed to predict particulate concentrations for comparison with State and National Ambient Air Quality Standards. Areas within the active mining area, such as the mine facilities, pit area, and reclamation areas, are not subject to these standards.

The isopleth lines on Figure 4 indicate annual average particulate concentrations that could result during peak production; the highest concentration at a location off the mine site could be 5.7 ug/m^3. This level would consume the allowable Class II PSD annual increment for particulates. With the annual background concentration added (24 up/m^3), the ambient level should not exceed State or Federal Ambient Air Quality Standards.

In addition to the annual particulate standard of 60 ug/m^3, North Dakota has a 24-hour standard of 150 ug/m^3 that cannot be exceeded more than once per year off the mine site. Figure 5 shows the predicted highest particulate concentrations for 24-hour averaging times, resulting from the proposed action. The predicted highest 24-hour values associated with the proposed action during peak production could be as high as 47 ug/m^3. This level would consume the allowable Class II PSD 24-hour increment for particulates. With the estimated 24-hour background concentration added (100 ug/m^3), the ambient level would be 147 ug/m^3. This level complies with the State and Federal Ambient Air Quality Standards. There is a possibility that the proposed action could violate State and Federal ambient TSP standards, but this is subject to the mine emissions and the corresponding background levels in the area.

Because the proposed action totally consumes the allowable Class II PSD increments for particulates, any associated PSD source could not contribute significantly (5 ug/m^3-24-hour) to the PSD's Class II annual or 24-hour particulates increment.

Several small sources of gaseous pollutants are associated with surface coal mining operations.

During peak production, the relatively small gaseous emissions associated with the mining operations are not expected to violate air quality standards. Gaseous emissions for mining sources were not modeled because of their expected limited impacts to the air quality.

TABLE 10
COMPARISON OF AMBIENT STANDARDS
FEDERAL VS. NORTH DAKOTA

	Federal Ambient Air Quality Standards (UPA)			North Dakota Ambient Air Quality Standards	
Pollutant	Wording of Standard	Secondary Standard	Primary Standard	Primary Standard	Wording of Standard
TOTAL SUSPENDED PARTICULATES	Annual geo. mean conc.	60 ug/m^3	75 ug/m^3	60 ug/m^3	Annual geo. mean conc.
	Max. 24-hr. concentration not to be exceeded more than once per year	150 ug/m^3	260 ug/m^3	250 ug/m^3	Max. 24-hr. conc. not to be exceeded more than once per year
SETTLED PARTICULATES (Dustfall)	(At present there is no federal standard)			15 tons/ sq. mile	Max. 3-month arithmetic mean in residential areas
				30 tons/ sq. mile	Max. 3-month arithmetic mean in heavy industrial areas
COEFFICIENT OF HAZE	(At present there is no federal standard)			0.4 coh. per 1000 linear ft.	Max. annual geo. mean
SULFUR DIOXIDE	Annual arith. avg. conc.		.03 ppm (80 ug/m^3)	60 ug/m^3 (0.02 ppm)	Max. annual arithmetic mean
	Max. 24-hr. concentration not to be exceeded more than once per year		.14 ppm (365 ug/m^3)	260 ug/m^3 (0.10 ppm)	Max. 24-hr. conc.
	Max. 3-hr. concentration not to be exceeded more than once per year	.50 ppm (1300 ug/m^3)		715 ug/m^3 (0.24 ppm)	Max. 1-hr. concentration
REACTIVE SULFUR (Sulfation)	(At present there is no federal standard)			0.24 mg SO_2/100 cm^3/day	Max. annual arithmetic mean
				0.50 mg SO_2/100 cm^3/day	Max. for a 1-month period
SUSPENDED SULFATE	(At present there is no federal standard)			4 ug/m^3	Max. annual arithmetic
				12 ug/m^3	Max. 24-hr. conc. not to be exceeded over 1 percent of the time
SULFURIC ACID MIST, SULFUR TRIOXIDE OR ANY COMBINATION THEREOF	(At present there is no federal standard)			4 ug/m^3	Max. annual arithmetic mean
				12 ug/m^3	Max. 24-hr. conc. not to be exceeded over 1 percent of the time
				30 ug/m^3	Max. 1-hr. concentration not to be exceeded over 1 percent of the time

TABLE 10 (cont.)
COMPARISON OF AMBIENT STANDARDS
FEDERAL VS. NORTH DAKOTA

	Federal Ambient Air Quality Standards (UPA)			North Dakota Ambient Air Quality Standards	
Pollutant	Wording of Standard	Secondary Standard	Primary Standard	Primary Standard	Wording of Standard
HYDROGEN SULFIDE	(At present there is no federal standard)			45 ug/m^3 (0.032 ppm)	Max. ½-hr. conc. not to be exceeded more than twice in any 5 consecutive days.
				75 ug/m^3 (0.054 ppm)	Max. ½-hr. conc. not to be exceeded over twice a year
CARBON MONOXIDE	Max. 3-hr. concentration not to be exceeded more than once per year	9 ppm (10 ug/m^3)	9 ppm (10 ug/m^3)	10 ug/m^3 (9 ppm)	Max. 3-hr. conc. not to be exceeded more than once per year
	Max. 1-hr. concentration not to be exceeded more than once per year	35 ppm (40 ug/m^3)	35 ppm (40 ug/m^3)	40 ug/m^3 (35 ppm)	Max. 1-hr. conc. not to be exceeded more than once per year
OZONE	Max. 1-hr. concentration not to be exceeded more than once per year	0.12 ppm (235 ug/m^3)	0.12 ppm (235 ug/m^3)	235 ug/m^3 (0.12 ppm)	Max. 1-hr. conc. not to be exceeded more than once per year
HYDROCARBONS (Less Meth.)	Max. 3-hr. concentration (6-9 a.m.) not to be exceeded more than once per year	.24 ppm (160 ug/m^3)	.24 ppm (160 ug/m^3)	160 ug/m^3 (0.24 ppm)	Max. 3-hr. conc. (6-9 a.m.) not to be exceeded more than once per year
NITROGEN DIOXIDE	Annual arithmetic avg. concentration	.05 ppm (100 ug/m^3)	.05 ppm (100 ug/m^3)	100 ug/m^3 (0.05 ppm)	Max. annual arithmetic mean
				200 ug/m^3 (0.10 ppm)	Max. 1-hr. conc. not to be exceeded over 1 percent of the time in any 3-month period
LEAD	Quarterly arithmetic mean		1.5 ug/m^3	1.5 ug/m^3	Quarterly arithmetic mean

Sources:

National Ambient Air Quality Standards. 1978.
North Dakota Air Pollution Regulations. 1978.

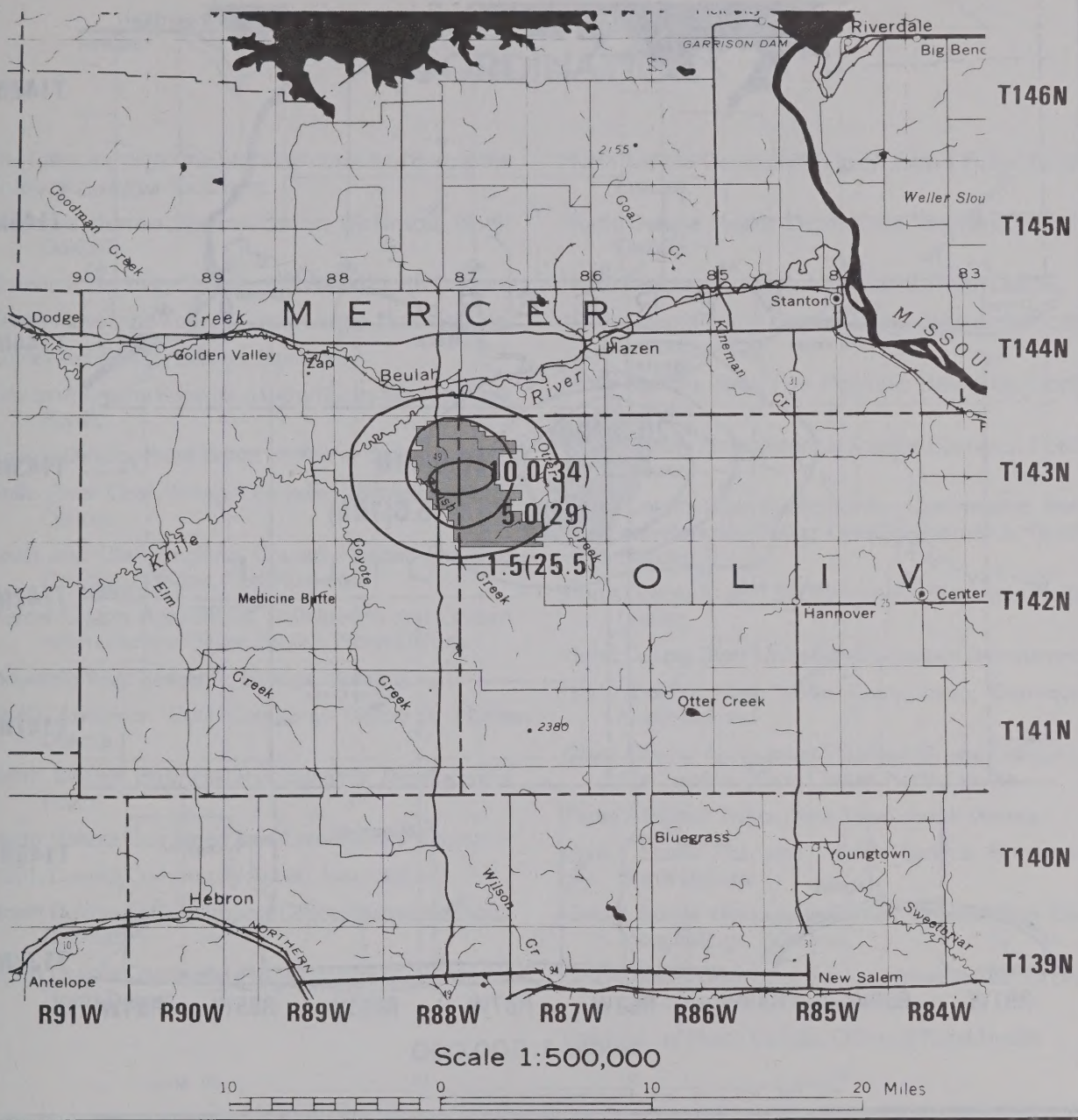
TABLE 11
FEDERAL AND STATE PSD STANDARDS

	Federal	State
Major Sources, subject to PSD review	100[1]	100[3]
(excludes fugitive dust emissions) (t/yr)	250[2]	250[4]
Major Sources, not subject to PSD review-counts against PSD increment	100[1]	100[3]
(considers fugitive dust emissions) (t/yr)	250[2]	250[4]
Deterioration Increments for Area Designations		
Particulates		
Class I		
annual geometric mean (ug/m^3)	5	5
24-hour maximum (ug/m^3)	10	10
Class II		
annual geometric mean (ug/m^3)	19	10
24-hour maximum (ug/m^3)	37	30
Class III		
annual geometric mean (ug/m^3)	37	37
24-hour maximum (ug/m^3)	75	75
Sulfur Dioxide		
Class I		
annual arithmetic mean (ug/m^3)	2	2
24-hour maximum (ug/m^3)	5	5
3-hour maximum (ug/m^3)	25	25
Class II		
annual arithmetic mean (ug/m^3)	20	15
24-hour maximum (ug/m^3)	91	91
3-hour maximum (ug/m^3)	512	512
Class III		
annual arithmetic mean (ug/m^3)	40	40
24-hour maximum (ug/m^3)	182	182
3-hour maximum (ug/m^3)	700	700

1. Listed sources; CFR Chapter 51:24
2. All other sources (includes coal mines); CFR Chapter 51:24
3. Listed sources; N.D.A.C. Chapter 33-15-15
4. All other sources (includes coal mines); N.D.A.C. Chapter 33-15-15

*SOURCES

Prevention of Significant Deterioration of Air Quality. 1978. Chapter 33-15-15 NDAC
Requirement for Preparation, Adaption and Submittal of Implementation Plan.
1978. Title 40 CFR, Part 51.



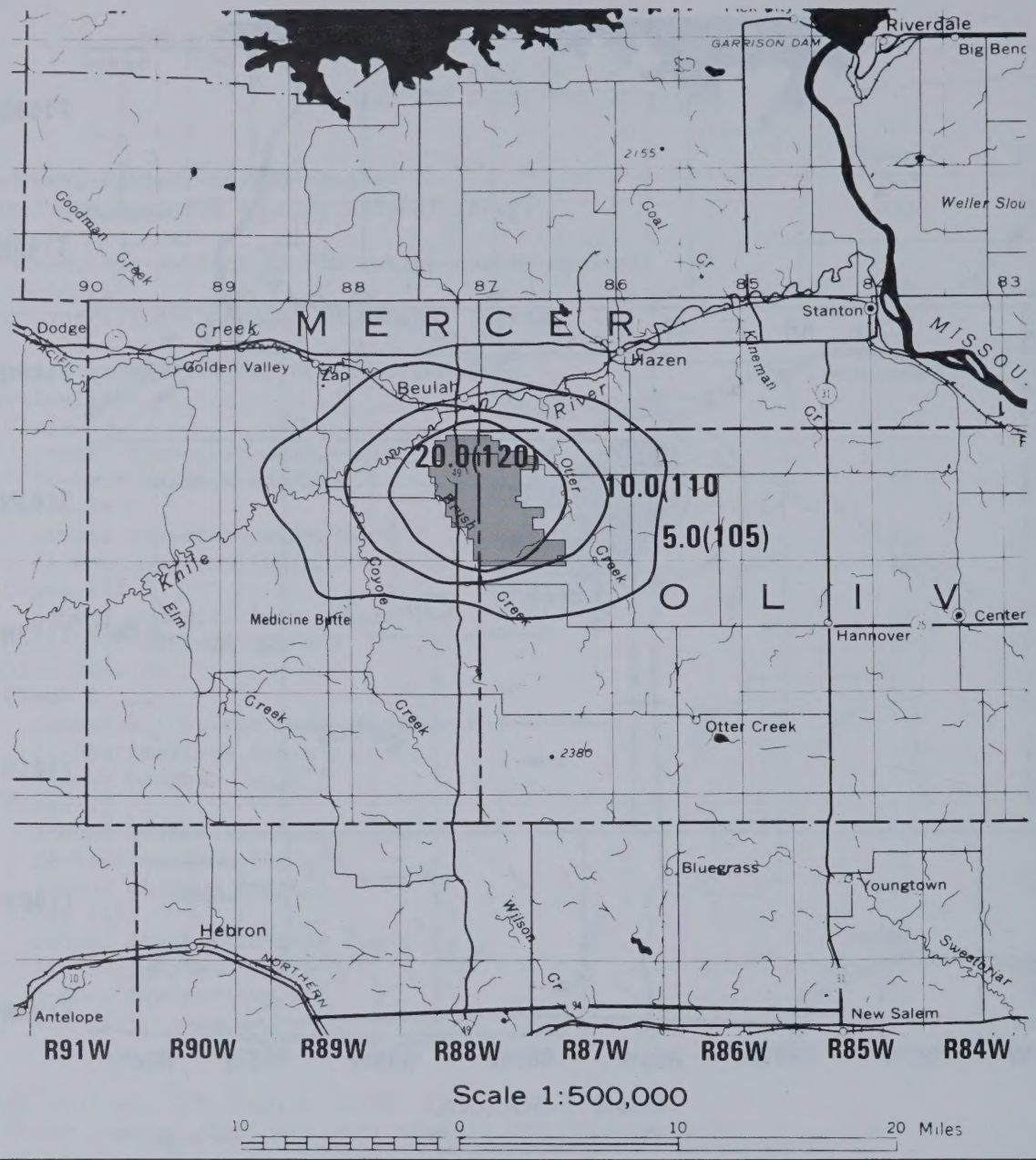
Schoolhouse Tract

-N-

TSP Annual Average Concentration (ug/m^3) Isopleths

Note: Number in parenthesis indicates predicted concentration plus background concentration.

FIGURE 4



Schoolhouse Tract

-N-

TSP Maximum 24-hour Concentration (ug/m^3) Isopleths

Note: Number in parenthesis indicates predicted concentration plus background concentration.

FIGURE 5

CHAPTER IV
CONSULTATION AND COORDINATION

The following organizations were consulted during the production of this document.

Badlands Human Service Center; Dickinson, North Dakota.

Bismarck Planning Director; Bismarck, North Dakota.

Center Mayor and Town Council; Center, North Dakota.

Cumin Associates; Billings, Montana.

Eastern Montana Social and Community Services Task Force.

Energy Development Board of Mercer County.

Knife River Coal Mining Company; Bismarck, North Dakota.

Lewis and Clark Regional Council Mandan Planning Director; Mandan, North Dakota.

Mercer County Agricultural, Stabilization and Conservation Service Office; Beulah, North Dakota.

Mountain West Research; Billings, Montana.

North American Coal Company; Bismarck, North Dakota.

North Dakota Business and Industrial Development Board.

North Dakota Combined Law Enforcement Council.

North Dakota Community Action Association.

North Dakota Energy Impact Office; Bismarck, North Dakota.

North Dakota Game and Fish Department; Bismarck, North Dakota.

North Dakota Geological Survey; Grand Forks, North Dakota.

North Dakota Health Department; Bismarck, North Dakota.

North Dakota Job Service; Bismarck, North Dakota.

North Dakota Social Service Board; Bismarck, North Dakota.

North Dakota State Fire Marshall; Bismarck, North Dakota.

North Dakota State Historical Society; Bismarck, North Dakota.

North Dakota State Public Service Commission, Reclamation and Siting Division; Bismarck, North Dakota.

North Dakota State Tax Department; Bismarck, North Dakota.

North Dakota State University, Sociology Department.

North Dakota State Water Commission; Bismarck, North Dakota.

Oliver County Agricultural Stabilization and Conservation Service Office; Center, North Dakota.

Three Affiliated Tribes; New Town, North Dakota.

United States Fish and Wildlife Service; Bismarck, North Dakota.

United States Geological Survey, Conservation Division; Billings, Montana.

United States Geological Survey, Water Resources Division; Bismarck, North Dakota.

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SUMMARY MATRIX
SCHOOLHOUSE TRACT
RESOURCE AND ENVIRONMENTAL CONSIDERATIONS

ELEMENT	PRESENT SITUATION	ANTICIPATED EFFECT OF LEASING/DEVELOPMENT	SIGNIFICANCE OF ANTICIPATED IMPACT	DATA RELIABILITY	COMMENTS
Topography	Rolling to hilly.	Less contrasting topography with slight modification of drainage patterns.	Low	Good	
Geology and Minerals					
Geologic Hazards	None identified.	None	N/A	Good	
Potential for Other Minerals	Low (Oil and Gas) - This tract is in the Williston Basin.	Low - There has been exploration activity in the area.	Mining could interfere with development of the oil and gas.	Good	
Paleontological Resources	Low - none identified to date.	Will improve knowledge of the resources near the mine.	Low		
Soils and Reclamation Potential					
Soil Erosion Potential	Wing - High over most of tract. Water - Moderate over most of tract.	Increase with soil handling operations but decrease during other stages of mining.	Minimal	Outstanding	
Toxic Elements in Soil	No problems	None	None	There has not been a need for this data.	

ELEMENT	PRESENT SITUATION	ANTICIPATED EFFECT OF LEASING/DEVELOPMENT	SIGNIFICANCE OF ANTICIPATED IMPACT	DATA RELIABILITY	COMMENTS
Chemicals Corrosive to Metal or Concrete	Corrosivity of most soil to: Untreated steel: Moderate to High; Concrete - Low to Moderate.	None	None	Outstanding	
Highly Saline/ Sodic Soil	There are some small scattered areas of saline/sodic soils in the tract.	These areas can possibly be improved through mining by replacing with better soil, improving drainage, etc.	Minimal	Outstanding	
Character of Subsurface Materials and/or Interburden	Extensive drilling in tract by Knife River Coal Company because of active mine. Generally, pH, sodium and salts, and clay content increase with depth. The top 20 feet of overburden is often of good quality and sometimes even to a depth of 40-80 feet.	Some instability problems (settling, piping) may appear with the onset of reclamation.	Minimal	Outstanding	
Reclamation Potential	Based on the soil suitability for cover of surface-mined land, the chances for successful reclamation by individual landowner and for the tract as a whole appear to be high. The breakdown of soil suitability totals from Table 2 are as follows: "Good" - 10,707 acres, 77%; "Fair" - 2,342 acres, 17%; and "Poor" - 791 acres, 6%. Precipitation could be a limiting factor for reestablishing vegetative cover some years.			Outstanding	

ELEMENT	PRESENT SITUATION	ANTICIPATED EFFECT OF LEASING/DEVELOPMENT	SIGNIFICANCE OF ANTICIPATED IMPACT	DATA RELIABILITY	COMMENTS
Hydrology					
Degradation of Water Quantity and Quality in Brush Creek	Low flows through this surface water system are fed by discharge from the shallow aquifers in the southern portion of the tract.	Lower transmissivity and poor water quality following mining in the tract will provide less discharge with poorer quality to Brush Creek.	Brush Creek is not covered by specific water quality standards and is not used as an irrigation water source	Hydrology - Acceptable Impact Prediction - Acceptable	
Drawdown of Shallow Groundwater level	Many wells in and surrounding the tract rely on shallow groundwater for domestic and livestock supplies.	Well finished in the mine disturbance zone near an open pit will have lowered water levels during mining.	Will affect between 15 and 30 wells used for domestic and stock water supplies.	Hydrology - Acceptable Well Inventory - Good	This will be a short term impact that will only occur at a time as mining progresses through the tract.
Degradation of Groundwater Quality	Lignite water does not meet Public Health Service drinking water quality standards. It is acceptable for domestic and stock water purposes since it is the best practical source.	Groundwater quality will be degraded in the tract.	Will affect between 10 and 20 wells used for domestic and stock water supplies.	Hydrology - Acceptable Well Inventory - Good	Replacement sources are available.
Vegetation					
Cropland	There are 3,339 acres of land in the tract that are currently being cropped.	Average annual loss of 86 acres excluding 1731 total acres of summer fallow. Annual production on this 86 acres would be 2167 bu. of wheat. Maximum loss in any one peak mining year would be 857 acres and 21,596 bu. of wheat.	Moderate to high, depending upon individual operation. Low to moderate for overall tract production.	Good	

ELEMENT	PRESENT SITUATION	ANTICIPATED EFFECT OF LEASING/DEVELOPMENT	SIGNIFICANCE OF ANTICIPATED IMPACT	DATA RELIABILITY	COMMENTS
Rangeland	Average annual production is 2,622 AUMs.	Average annual loss of 56 AUMs. Each acre would be out of production from 10 to 15 years. Maximum loss for any one peak mining year would be 1104 acres and 551 AUMs.	Moderate to high, depending upon individual operation. Low to moderate for overall tract.	Good	
Agriculture	There are 27 operators in the tract	The same number of operators will be affected, to varying degrees, by a long term but temporary loss of acreage for agricultural production.	Very significant to the operators involved.	Outstanding	
	29% of the involved operators' acreage is in the tract.				
	62% of the acreage in the tract is operated by lessees.	Non-owners will lose the use of their leased acreage with no compensation.	Significant to non-owners.	Outstanding	
Threatened or Endangered Species	There are no threatened or endangered species (on the Federal List) in the tract.	None	None	Good	

ELEMENT	PRESENT SITUATION	ANTICIPATED EFFECT OF LEASING/DEVELOPMENT	SIGNIFICANCE OF ANTICIPATED IMPACT	DATA RELIABILITY	COMMENTS
Land Use	Agricultural, mining of coal, minor roadways and local utilities, State Highway 49, a 16" pipeline and high voltage transmission lines.	Displacement of existing agricultural use. Relocation or bypass of roads and utilities.	See Vegetation and Agriculture sections. Temporary inconvenience.	Acceptable	
Recreation Values	Less than 5% of tract used for recreation.	Loss of recreational areas and added stress on available recreational opportunities.	Limited recreational opportunities make impacts signigicant.	Good - Based on current studies.	
Aesthetics	Agriculture and mining. Mining in vicinity and in the region. Viewed from State Highway 49 and highly visible. Low scenic and aesthetic value.	Change of aesthetic quality on tract but coal mining is accepted in the region and locality and appears as part of the character of the land.	Insignificant in both short and long term. With reclamation, visual amenity will likely improve after mining.	Acceptable	

ELEMENT	PRESENT SITUATION	ANTICIPATED EFFECT OF LEASING/DEVELOPMENT	SIGNIFICANCE OF ANTICIPATED IMPACT	DATA RELIABILITY	COMMENTS
Wildlife					
Sensitive Wildlife and Essential Habitats	Sensitive wildlife habitat for about 31 species. Whooping crane and Northern Swift Fox are identified with the areas.	Coal mining and attendant actions would severely disrupt and destroy locally significant wetlands and woodlands interspersed with native prairie which singly and in composite constitute the essential habitats for 31 sensitive wildlife species and many more common wildlife. Offsite aquatic habitats of Otter, Coyote, Brush, and Spring Creek Knife and Missouri Rivers, and Garrison Reservoir would be recipients of potential point and nonpoint pollution.	There would be a significant area loss of wildlife resources if mining occurs in the essential wetland, woodlands and native prairie.	1980 CIR aerial photo interpretation by Fish & Wildlife Service, Western Energy and Land Use Team. Unsuitability Criteria Application Team (FWS, NDGF & BLM Biologists). Wildlife data quality is high.	To date there are no data to direct successful recreation (compensation) of native woodlands and wetlands after strip mining in this country. Native prairie comprised of native plant species has not been recreated from mine spoil. If some forms of habitat replacement achieved during mining and thereafter, then the negative impacts to wildlife resources would be proportional to the successful compensation.
General					Increased poaching and disturbance would significantly reduce all wildlife populations in region. If not controlled it would significantly reduce recreation opportunities.
Cultural/ Historical Values	Sample Surveys are complete. Recorded cultural resources will not affect coal mining.	Loss of sites as a result of mining activity.	Anticipated impact is not great because resources can be mitigated through data recovery.	Good	None

ELEMENT	PRESENT SITUATION	ANTICIPATED EFFECT OF LEASING/DEVELOPMENT	SIGNIFICANCE OF ANTICIPATED IMPACT	DATA RELIABILITY	COMMENTS
Net Energy Analysis	No fossil fuels are being produces from this tract.	A total of 5 million tons of coal (1.4 million tons of federal coal) will be produced annually. (These figures include all the federal coal.)	Production: 6919 Btu/lbs. of coal Consumption: 37.7 Btu/lb. of coal Ratio of production to consumption 183.5	Acceptable	
Climate and Air Quality	Good	Totally consumes the allowable class II PSD 24-hour increment for particulates.	Significant	Fair	Any associated PSD source could not contribute significantly ($5ug/m^3$ - 24-hour) to the PSD's class II 24-hour particulate increment.
		SOCIAL AND ECONOMIC CONSIDERATIONS			
Employment	Community services generally adequate for current employment site.	Small increase in employment.	Insignificant	Acceptable	
Population	Community services generally adequate for current population.	Small increase in population.	Insignificant	Acceptable	
Regional Income	$4560 estimated regional income per capita.	Very small in any increase in regional income per capita.	Insignificant	Acceptable	
Infrastructure Assessment (Community Services)	Most community services generally adequate; often with one or two inadequate services.	No change in community service adequacy.	Insignificant	Acceptable	

SCHOOLHOUSE TRACT
UNSUITABILITY CRITERIA RESULTS

Criterion	Applicable to Tract	Exception Used (if applicable)	Additional Data Needed	Comments
1. Federal land systems	No	---	No	---
2. Rights-of-way and easements	No	---	No	---
3. Buffer zones	Yes	No	No	Exceptions may be applied at mine plan.
4. Wilderness study areas	No	---	No	---
5. Scenic areas	No	---	No	---
6. Land used for scientific studies	No	---	No	---
7. Historic lands and sites	No	---	No	---
8. Natural areas	No	---	No	---
9. Federally listed endangered species	Yes, whooping cranes and Northern Swift Fox known or believed to use this region.	---	Swift Fox data limited.	Exclusion of strip mining from wetlands would protect most whooping crane areas.
10. State listed endangered species	No	---	No	None exist.
11. Eagle nests	No	---	No	---

Criterion	Applicable to Tract	Exception Used (if applicable)	Additional Data Needed	Comments
12. Eagle roosts and concentration areas	No	---	No	---
13. Falcon cliff-nesting sites	No	---	No	---
14. Migratory birds	Yes	Yes, interagency team applied exceptions as suitable for mining with stipulations.	No	Seven species in combination with Criterion 15.
15. State resident fish and wildlife	Yes	Yes, interagency team applied exceptions as suitable for mining with stipulations.	No	About 30 species in combination with Criterion 14.
16. Flood plains	Yes	No	No	---
17. Municipal watersheds	No	---	No	---
18. National resource waters	No	---	No	---
19. Alluvial valley floors	No	---	No	---
20. State proposed criteria	No	---	No	Does not exist.

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